

AEROSPACE SHORT COURSES

UNIVERSITY OF KANSAS

2012
COURSE
CATALOG



DALLAS / FORT WORTH
March

SEATTLE
April

SAN DIEGO
September

ORLANDO
November

aeroshortcourses.ku.edu/air
Toll-free in the U.S.: 877-404-5823 or 785-864-5823

KU
THE UNIVERSITY OF
KANSAS
Continuing Education

ON-SITE AEROSPACE SHORT COURSES

Realize substantial savings by bringing our outstanding instructors to your workplace.

All of our courses, including the courses listed in our public schedule, are available for on-site presentations. By bringing our courses to your company, you save staff time and travel expenses, maintain company confidentiality, schedule courses at times convenient to you, and train employees in a team environment.

Benefits of KU Aerospace On-Site Training

When you choose the KU Aerospace Short Course Program for your on-site training, you:

- Receive training that meets your specific needs
- Pay only for the training you need
- Train when it fits your schedule
- Incur lower costs per participant
- Save employee travel, hotel and meal expenses
- Reduce the time employees are away from work
- Train as a team to enhance productivity
- Maintain company confidentiality

Contact Us

Obtain a no-cost, no-obligation proposal for an on-site course:

Zach Gredlics

On-site Program Manager
E-mail aerosite@ku.edu
Phone 785-864-1066
Fax 785-864-5074

On the cover: The Subsonic Ultra Green Aircraft Research, or SUGAR, Volt future aircraft design comes from the research team lead by The Boeing Company. The Volt is a twin-engine concept with a hybrid propulsion system that combines gas turbine and battery technology, a tube-shaped body and a truss-braced wing mounted to the top of the aircraft. The aircraft is designed to fly at Mach 0.79 carrying 154 passengers 3,500 nautical miles. The SUGAR Volt is among the designs for its NASA Research Announcement-funded studies into advanced aircraft that could enter service in the 2030–2035 timeframe.

Image Credit: NASA/The Boeing Company

Frequently Asked Questions

Where can you provide in-house training?

KU Aerospace Short Course Program can provide training to most parts of the world; some restrictions apply. Please contact us for more information.

What does the company provide?

You provide the attendees, a classroom and audio-visual equipment such as a projector and a screen. We will send you a description of the course needs in advance to prepare for the class. If you cannot provide a classroom, we can set up a course at a nearby hotel or conference center for an additional charge.

What does KU provide?

KU provides the instructors' honoraria, their travel, all course materials, shipping and customs charges, certificates with CEUs for participants who attend all days, course evaluation and coordination.

Can the course content be modified?

KU Aerospace Short Course Program staff will be happy to work with you to discuss your requirements and will emphasize areas that best accommodate your needs.

How is an on-site course price determined?

To make it cost-effective for all parties, we base our course fees on 20 participants and offer substantial discounts for each additional participant. We also have worked with organizations to form consortiums with other area companies to share costs.

The course fee of an on-site class depends on the instructors' honoraria, the instructors' travel reimbursements, the cost of the course materials specific for that class and the shipping cost of the course materials.

How far in advance do you need to schedule a course?

In order to schedule the instructor(s) and order the course materials, we request at least 8 to 12 weeks of lead time prior to the actual course date.

Industry Leaders Who Have Supported the KU Aerospace Short Course Program

Airbus
BAE Systems
Bell Helicopter Textron
The Boeing Company
Bombardier-Learjet, Inc.
Cathay Pacific
Cessna Aircraft Company
DCA-BR (Organização Brasileira para o Desenvolvimento da Certificação Aeronáutica)
Embraer-Empresa Brasileira de Aeronáutica S.A.
European Aviation Safety Agency
Federal Aviation Administration
Garmin
GE Aviation
General Atomics
Goodrich Corporation
Gulfstream Aerospace Corporation
Hawker Beechcraft Corporation
Honeywell, Inc.
Italian Air Force
Lockheed Martin Corporation
Lycoming Engines
NASA
National Aerospace Laboratory of The Netherlands
Northrop Grumman Corporation
Pilatus Aircraft Ltd.
QinetiQ Ltd.
Rockwell Collins
SAAB Aircraft AB
Samsung
Sierra Nevada Corporation
Sikorsky Aircraft Corporation
Spirit AeroSystems
SR Technics
Transport Canada
United States Department of Defense (Air Force, Army, Navy and Coast Guard)

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March 5–9	Principles of Aeroelasticity <i>Thomas William Strganac</i>	AA121330	47
March 5–9	Process-Based Management in Aerospace: Defining, Improving and Sustaining Processes <i>Michael Wallace</i>	AA121340	49
March 6–8	FAA Certification Procedures and Airworthiness Requirements as Applied to Military Procurement of Commercial Derivative Aircraft/Systems <i>Gilbert L. Thompson, Robert D. Adamson</i>	AA121350	34
March 6–9	Certification Engineering of Utility-Scale Wind Turbines (NEW) <i>Kyle K. Wetzel</i>	AA121360	28

Seattle, Washington DoubleTree Guest Suites Southcenter

April 23–27	Aircraft Structural Loads: Requirements, Analysis, Testing and Certification <i>Wally Johnson</i>	AA121370	20
April 23–27	Commercial Aircraft Safety Assessment and 1309 Design Analysis <i>Marge Jones</i>	AA121380	29
April 23–27	Flight Control and Hydraulic Systems <i>Wayne Stout</i>	AA121390	38
April 23–27	Flight Test Principles and Practices <i>Donald T. Ward, George Cusimano</i>	AA121400	39
April 23–27	Fundamental Avionics <i>Albert Helfrick</i>	AA121410	41
April 24–26	FAA Functions and Requirements Leading to Airworthiness Approval <i>Gilbert L. Thompson, Robert D. Adamson</i>	AA121420	36
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San Diego, California Marriott Mission Valley

September 10–13	Sustainment and Continued Airworthiness for Aircraft Structures (NEW) <i>Marv Nuss, Mark S. Ewing</i>	AA131000	56
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September 10–14	Aircraft Lightning: Requirements, Component Testing, Aircraft Testing and Certification <i>C. Bruce Stephens</i>	AA131030	19
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2012 KU AEROSPACE SHORT COURSES SCHEDULE

San Diego, California Marriott Mission Valley

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September 17–21	Aerodynamic Design Improvements: High–Lift and Cruise <i>Case (C.P.) van Dam, Paul Vijgen</i>	AA131090	14
September 17–21	Fundamental Avionics <i>Albert Helfrick</i>	AA131100	41
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September 17–21	Operational Aircraft Performance and Flight Test Practices <i>Mario Asselin</i>	AA131120	46
September 17–21	Structural Composites <i>Max U. Kismarton</i>	AA131130	54
September 18–20	Subcontract Management in Aerospace Organizations <i>Robert Ternes</i>	AA131140	55
September 18–20	Unmanned Aircraft System Software Airworthiness <i>Willie J. Fitzpatrick, Jr.</i>	AA131150	58
September 20–21	Integrated Modular Avionics (IMA) and DO–297 <i>Leanna K. Rierson</i>	AA131160	44
September 17–21	Combined Complex Electronic Hardware Development and DO–254 (AA131080) and Integrated Modular Avionics (IMA) and DO–297 (AA131160) (SAVE \$) <i>Jeff Knickerbocker, Leanna K. Rierson</i>	AA131170	30, 44

Orlando, Florida DoubleTree by Hilton Orlando at SeaWorld

November 5–9	Aircraft Structural Loads: Requirements, Analysis, Testing and Certification <i>Wally Johnson</i>	AA131180	20
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November 5–9	Flight Control and Hydraulic Systems <i>Wayne Stout</i>	AA131200	38
November 5–9	Project Management for Aerospace Professionals <i>Herbert Tuttle</i>	AA131210	50
November 6–8	Airplane Subsonic Wind Tunnel Testing and Aerodynamic Design <i>Willem A.J. Anemaat</i>	AA131220	25
November 6–8	Flight Testing Unmanned Aircraft – Unique Challenges (NEW) <i>George Cusimano</i>	AA131230	40
November 6–9	Airborne Equipment Design and RTCA DO–160 <i>Ken Vranish, Ernie Condon</i>	AA131240	17
November 6–9	Software Safety, Certification and DO–178B <i>Jeff Knickerbocker</i>	AA131250	53

EARN A CERTIFICATE FOR ANY FOUR COURSES WITHIN A TRACK

Have you attended, or will attend, more than one aerospace short course? Apply to obtain a certificate for participating in any four courses listed within any of the following tracks. There is no fee for obtaining a certificate; only a nominal fee for shipping is charged.

Aerospace Compliance

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- FAA Conformity, Production and Airworthiness Certification Approval Requirements–p. 35
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- Reliability and 1309 Design Analysis for Aircraft Systems–p. 52
- Sustainment and Continued Airworthiness for Aircraft Structures–p. 56

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Aircraft Maintenance and Safety

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Aircraft Structures

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- Aircraft Structures Design and Analysis–p. 21
- Structural Composites–p. 54
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Avionics and Avionic Components

- Airborne Equipment Design and RTCA DO-160–p. 17
- Aircraft Lightning: Requirements, Component Testing, Aircraft Testing and Certification–p. 19
- Complex Electronic Hardware Development and DO-254–p. 30
- Fundamental Avionics–p. 41
- Integrated Modular Avionics (IMA) and DO-297–p. 44
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Flight Control Systems Design

- Applied Nonlinear Control and Analysis–p. 26
- Digital Flight Control Systems: Analysis and Design–p. 32
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- Modelling and Analysis of Dynamical Systems Using MATLAB–p. 45

Flight Tests and Aircraft Performance

- Acquisition of Digital Flight Test Data from Avionics Buses: Techniques for Practical Flight Test Applications–p. 12
- Advanced Flight Tests–p. 13
- Airplane Flight Dynamics: Open and Closed Loop–p. 22
- Airplane Performance: Theory, Applications and Certifications–p. 23
- Flight Test Principles and Practices–p. 39
- Flight Testing Unmanned Aircraft – Unique Challenges–p. 40
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Management and Systems

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- Project Management for Aerospace Professionals–p. 50
- Subcontract Management in Aerospace Organizations–p. 55

HOW TO RECEIVE A COMBINED/GROUP CERTIFICATE

If you have taken courses in the past and you're interested in a certificate, you will need to provide the following information to Kim Hunsinger, Assistant Director for Program Management and Marketing at kah@ku.edu:

- Your full name
- The calendar year(s) when you attended the classes
- The course titles within a track listed on the previous page and the instructor or instructors who taught the classes
- The public course venue or company facility where each class was held
- The project numbers of the courses provided on your individual course certificates
- Your current address and phone number

Upon verification of your eligibility, you will be asked to pay a nominal fee for shipping and handling (USD \$10.00 for domestic shipping and USD \$25.00 for international shipping) and a combined certificate will be mailed to you at your current address.

KU AEROSPACE SHORT COURSES ON

Join us in a conversation on aerospace training opportunities on LinkedIn. KU Aerospace Short Courses group on LinkedIn provides opportunities for networking, idea exchanges and training suggestions among the alumni and friends of this short course program. All alumni are encouraged to join.



VIDEO CONFERENCING AVAILABLE

KU's video classroom can reach your employees around the world. The state-of-the-art video classroom at KU Continuing Education allows you to reach as many as eight international locations simultaneously in real time. Using the latest advances from Polycom Pro-Motion video technology and Creston audio/video, you can train all your employees while saving thousands of dollars in travel expenses. Located in the Central Time Zone, the video classroom allows you to conveniently reach every corner of the North American continent during regular business hours, and other countries based on their time zones.

This video classroom offers a great learning environment and an affordable alternative to face-to-face classes. The courses can be presented in their standard version or they can be customized like on-site courses. While the technology is the room's hallmark, the space is also true to its roots as a place of learning. The room is quiet and well lit, so even if you do not use all its technological marvels, it provides a wonderful atmosphere for learning or conducting business.

To organize a live video class, please contact Kim Hunsinger, Assistant Director of Program Management and Marketing at 785-864-4758 or kah@ku.edu.

LODGING AND TRAVEL INFORMATION

- Lodging and transportation costs are not included in the course fees.
- Attendees are responsible for acquiring their own lodging and travel arrangements.
- The following lodging and transportation suggestions are offered as a convenience and do not represent an endorsement.

Dallas/Fort Worth, Texas

March 5–9, 2012

DoubleTree by Hilton–DFW Airport North
4441 West John Carpenter Freeway
Irving, Texas 75063

A limited number of rooms has been reserved at the Doubletree by Hilton–DFW Airport North for course attendees. The rate is \$107 for a standard single or double room plus applicable state and local occupancy taxes. These rooms will be held as a block, unless depleted, until February 11, 2012, at which time they will be released to the public. After February 11, room rate and availability cannot be guaranteed.

To ensure that you get all the benefits available to our group including complimentary Internet in the guest rooms and free parking, please make sure you or your travel agent book your hotel room in the University of Kansas room block. Our group code is UNK. To make a reservation, call 972-929-8181 or (toll-free worldwide) 1-800-222-8733. All reservations must be guaranteed by credit card or first night's room deposit.

The Dallas Fort Worth Airport–(DFW) is 2 miles (3.2 km) from the Doubletree by Hilton–DFW Airport North. The hotel provides complimentary shuttle to and from DFW 24 hours daily. No reservations are required. To request a shuttle, call 972-929-8181.

Dallas Love Field Airport–(DAL) is 12.5 miles (20.1 km) from the Doubletree by Hilton–DFW Airport North. SuperShuttle provides transportation for \$18.00 each way. (Fees are subject to change.) Arrangements can be made online at www.supershuttle.com or by calling (toll-free in the United States) 800-258-3826. The local number is 817-329-2000. Be sure to use our group code UPBP7 to receive a discounted rate.

Seattle, Washington

April 23–27, 2012

DoubleTree Guest Suites by Hilton–Seattle Southcenter
16500 Southcenter Parkway
Seattle, Washington 98188

A limited number of rooms has been reserved at the Doubletree Guest Suites by Hilton–Seattle Southcenter for course attendees. The rate is \$129 for a standard single/double room plus local occupancy taxes. These rooms will be held as a block, unless depleted, until April 12, 2012, at which time they will be released to the public. After April 12, room rate and availability cannot be guaranteed.

To ensure that you get all the benefits available to our group, including complimentary self-parking and Internet in the guest rooms, please make sure you or your travel agent book your hotel room in the University of Kansas room block. State that you will be attending a University of Kansas aerospace short course and give the Group Code UOK.

To make your reservation, call 206-575-8220 or (toll-free worldwide) 800-222-8733. All reservations must be guaranteed with a major credit card or first night room deposit.

The Seattle-Tacoma International Airport (SEA) is 3.5 miles (5.6 km) from the hotel. The hotel provides complimentary shuttle service. No reservation is required. The hotel shuttle courtesy phone is located on the baggage claim level. There are two Doubletree properties near the airport. Make sure to take the shuttle for the Doubletree Guest Suites by Hilton–Seattle Southcenter.

The Doubletree Guest Suites by Hilton–Seattle Southcenter also offers complimentary shuttle to the light rail train station. Getting to downtown Seattle is easy using this new transit system.

California, Maryland

June 4–8, 2012 and October 15–19, 2012

Southern Maryland Higher Education Center
44219 Airport Road
California, Maryland 20619



The University of Kansas Aerospace Short Course Program will present four aerospace short courses at the Southern Maryland Higher Education Center, California, Maryland. There is no hotel room block associated with this event. For a list of area hotels, please visit the St. Mary's County Travel and Tourism website: tour.co.saint-marys.md.us. Parking is free at this location.

 For the most current information on our courses and events, including convenient weblinks to assist you with making your travel plans, please visit our website at aeroshortcourses.ku.edu/air/locations/.

San Diego, California

September 10–14 and September 17–21, 2012

San Diego Marriott Mission Valley
8757 Rio San Diego Drive
San Diego, California 92108

A limited number of rooms has been reserved at the San Diego Marriott Mission Valley for course attendees. The rate is \$133 for a single/double room plus applicable state and local occupancy taxes. These rooms will be held as a block, unless depleted, until August 26, 2012, at which time they will be released to the public. After August 26, room rate and availability cannot be guaranteed.

To ensure that you get all the benefits available to our group, including complimentary Internet in the guest rooms and discounted parking, please make sure you or your travel agent book your hotel room in the University of Kansas room block. State that you will be attending a University of Kansas aerospace short course and give the group code KANKANA. To make your reservation, call 619-692-3800 or (toll-free worldwide) 800-228-9290. All reservations must be guaranteed with a major credit card or first night room deposit.

Participants are responsible for their own parking fees. The San Diego Marriott Mission Valley will offer a discounted rate of \$5.00 a day for overnight self-parking and day guests.

The San Diego International Airport (SAN) is 8.1 miles (13 km) from the hotel. SuperShuttle provides transportation for \$12.00 each way to and from the Marriott Mission Valley hotel. (Fees are subject to change.) Arrangements can be made online at www.supershuttle.com or by calling (toll-free in the United States) 800-258-3826. The local number is 858-974-8885. Be sure to use our group code UPBP7 to receive a discounted rate.

Orlando, Florida

November 5–9, 2012

DoubleTree by Hilton Orlando at SeaWorld
10100 International Drive
Orlando, Florida 32821

A limited number of rooms has been reserved at the DoubleTree by Hilton Orlando at SeaWorld for course attendees. The rate will be the U.S. federal government per diem for November 2012 for a single/double room plus applicable state and local occupancy taxes. These rooms will be held as a block, unless depleted, until October 22, 2012, at which time they will be released to the public. After October 22, room rate and availability cannot be guaranteed.

To ensure that you get all the benefits available to our group, including complimentary self-parking and Internet in the guest rooms, please make sure you or your travel agent book your hotel room in the University of Kansas room block. No group code number was available at the time of publishing. Check our website for updated information. To make a reservation, call 407-352-1100 or (toll-free worldwide) 1-800-445-8667. State that you will be attending a University of Kansas aerospace short course. All reservations must be guaranteed by credit card, guest check or money order.

The Orlando International Airport (ORL) is 13 miles (20.9 km) from the DoubleTree by Hilton Orlando at SeaWorld. Mears Transportation provides 24 hour shuttle service for \$19 one-way or \$30 round trip. (Fees are subject to change.) Reservations can be made on-line or walk-up service is available at the Mears Transportation kiosk on level one of the airport. For additional information, call them at 407-423-5566.

Are you planning to attend one of our programs in the United States but are not a U.S. citizen?
 Please visit travel.state.gov/visa for visa and travel information.

GENERAL INFORMATION aeroshortcourses.ku.edu/air

Phone 785-864-5823 or toll-free within the U.S. 877-404-5823

Fax 785-864-4871

E-mail kuce@ku.edu

Mail KU Continuing Education
Aerospace Short Course Program
1515 Saint Andrews Drive
Lawrence, Kansas 66047-1619 • U.S.

**AEROSPACE
SHORT COURSES
UNIVERSITY OF KANSAS**

Enroll Anytime

Complete the registration form on the back cover to enroll by mail or fax. To enroll online, visit aeroshortcourses.ku.edu/air.

Enrollment is limited and will be accepted in order of receipt. We recommend that you register as soon as possible so that you can secure your place and we can prepare the proper amount of course material. Pre-registration is required for your protection; otherwise, the course could be cancelled due to insufficient enrollment.

A confirmation letter will be mailed, faxed or e-mailed to each enrollee prior to the short course. Travel information will be included and also will be available on the website. If you do not receive a confirmation packet, please contact us at one of the above numbers.

Lodging and travel information for each class site can be found on pages 8 and 9.

Fees/Billing

All fees are payable in U.S. dollars and are due at the time the class is held. Fees are listed on each course page.

We accept MasterCard, VISA, Discover and American Express. You may mail a company check in U.S. dollars to the University of Kansas Continuing Education, 1515 Saint Andrews Drive, Lawrence, KS 66047-1619, U.S. Please make checks payable to The University of Kansas and please include your invoice number on your check.

You may wire payment in U.S. dollars to US Bank of Lawrence, 900 Massachusetts, Lawrence, Kansas 66044, U.S. In the wire you must refer to KU Aerospace Continuing Education and include your invoice number. Please be sure to include any bank transfer fees. For account and ACH or routing number, please call 785-864-5823. You must be registered before requesting bank transfer information.

Future Course Discount

All paying participants in a public short course are eligible for a 10 percent discount on all public short courses taken within one calendar year of the original class. All discounts must be requested when making your registration. (The future course discount cannot be combined with any other class discounts.) Please call 785-864-5823 or toll-free within the U.S. 877-404-5823 for more information regarding the future course discount.

Late Payment Fee

All course fees are due at the time the class is held. KU allows a 30-day grace period. Any fees that remain unpaid after 30 days following the class will be assessed a late fee of \$100.

Refund/Cancellation Policy

We encourage you to send a qualified substitute if you cannot attend. If you wish to transfer you have one year from the original course date to transfer and complete a short course or a refund will automatically be issued. A full refund of registration fees will be available if requested in writing and received two weeks before a course. After that date, refunds will be made, but an administrative fee may be assessed. If no prior arrangements have been made, no refunds will be made after 30 calendar days following the event.

The University of Kansas Continuing Education reserves the right to cancel any short course and return all fees in the event of insufficient registration, instructor illness or national emergency. The liability of the University of Kansas is limited to the registration fee. The University of Kansas will not be responsible for any losses incurred by the registrants including, but not limited to, airline cancellation charges or hotel deposits.

Discounts

Group discounts are available for companies registering more than two people for the same class at the same time. All participants eligible for the discount will be billed together on the same invoice. The discount rates are as follows:

2–4 people	5% discount
5–9 people	10% discount
10–14 people	15% discount
15+ people	20% discount

If you have more than 10 people, ask about our on-site program. For more information, see page 2.

Class

Location: The course location will be included in your confirmation letter. Smoking is limited to outside the building. No audio or video recording is permitted.

Accessibility: We accommodate persons with disabilities. Please call our office or e-mail us to discuss your needs. To assure accommodation, please register at least two weeks before the start of the event, earlier if possible.

Course Schedule: The University of Kansas Continuing Education and/or its instructors reserve the right to adjust course outlines, schedules and/or materials. Class times and total hours are approximate and may be adjusted by the instructor(s) as the situation warrants.

Instructors: The University of Kansas Continuing Education reserves the right to substitute an equally qualified instructor in the event of faculty illness or other circumstances beyond its control. If an equally qualified instructor is not available, the class will be cancelled.

Certificate of Attendance: A certificate of attendance will be awarded to each participant who is present for 100 percent of the class.

Continuing Education Units (CEUs) are available but may not be used for college credit.

What Our Participants Say

KU has perfected the administration of short courses: combining the right instructors with relevant topics in great locations. Everything runs smoothly, enabling the participants to focus on learning.

Stephanie Smith
Mechanical Engineer
Seattle public course
April 2010

Our instructor took a week of which I thought I would be pounding my head against the desk and turned it into a riveting reminder of why I love aero engineering in the first place.

Participant
San Diego public course
September 2010

Well organized, well taken care of, friendly and helpful staff and instructors. Great opportunity to network!

Jennifer Accolti-Gil
Test Conductor
Northrop Grumman Corporation
Seattle public course
April 2010

I did not realize how much I needed this training. Great delivery, awesome support and perfect venue Thanks.

Participant
Fort Worth public course
June 2011

Great learning experience, these courses provide great knowledge and new ideas for the development of new technologies.

Manuel Savcede
Flight Test Manufacturing Engineering
The Boeing Company
Seattle public course
April 2010

ACQUISITION OF DIGITAL FLIGHT TEST DATA FROM AVIONICS BUSES: TECHNIQUES FOR PRACTICAL FLIGHT TEST APPLICATIONS

Instructors: Keith Schweikhard and Tim Iacobacci

Available as on-site course

Contact us for a no-cost, no obligation proposal for an on-site course:

Zach Gredlics

On-site Program Manager

E-mail aerosite@ku.edu

Phone 785-864-1066

Times/CEUs

Class time 21 hours

CEUs 2.1

Description

Designed for practicing engineers who use bus data in flight test work. Presented from a user's point of view, the course shows how to recognize and accommodate problems associated with using avionics information as traditional flight test data. The course addresses recording and retrieving these data properly on standard PCM instrumentation.

Target Audience

Designed for flight test and analysis engineers. Course material and presentation is oriented toward the data user and not toward experienced system design engineers.

Fee

Includes instruction and a course notebook.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Flight Tests and Aircraft Performance Track. See page 6.

Day One

- Overview of flight test data acquisition approaches
- Overview of digital avionics and bus communication
- Common avionics bus protocols (ARINC and MIL-STD)

Day Two

- Instrumentation considerations for digital data acquisition
- Bus architecture and implementation techniques
- Parameter selection considerations

Day Three

- Case studies, real-world examples and troubleshooting
- Data acquisition and analysis problems
- Hardware implementation problems
- Data quality analysis tools
- Configuring data acquisition hardware to be analysis friendly
- Analysis techniques workshop
- Avionics data acquisition course summary
- Wrap-up and questions

A participant can expect to learn

- common avionics bus communications protocols;
- approaches and pitfalls associated with the acquisition of test data from avionics data buses;
- common data problems associated with the acquisition and analysis of flight test data from avionics buses;
- data analysis techniques used to identify potential data problems.

Contact Us. Obtain a no-cost, no-obligation proposal for an on-site course:

Zach Gredlics: On-site Program Manager
E-mail aerosite@ku.edu • Phone 785-864-1066

ADVANCED FLIGHT TESTS

Instructors: Donald T. Ward and Thomas William Strganac

Day One

- Why such tests are necessary; philosophy and attitudes, overview of documents describing governing regulations, history
- Fundamental principles of aeroelasticity: description of static and dynamic aeroelastic phenomena; definitions, terminology and assumptions; limitations of theory; flutter analysis; development of basic aeroelastic equations; interpretation of supporting analyses
- Experimental and analytical tools used in preflight preparation: modal methods, ground vibration tests and analysis, wind tunnel test techniques, interpretation of dynamically similar wind tunnel model data

Day Two

- Instrumentation for flutter envelope expansion: suitable sensors, near real-time data analysis
- Subcritical response techniques, interpretation of supporting analyses
- Interpreting test results: analyzing real-time data, postflight analysis of data
- Expanding the envelope: excitation methods, clearance to 85 percent flutter envelopes, example programs
- Discussions of limit cycle oscillations

Day Three

- Foundations of post-stall flight testing: definitions of stall, departure, post-stall gyrations and spins; description of spin modes and spin phases; development of large disturbance equations of motion; idealized flight path in a spin; balance of aerodynamic and inertial forcing functions; autorotation and its causes; effect of damping derivatives; effect of mass distribution; simplification of post-stall equations of motion
- Aerodynamic conditions for dynamic equilibrium: pitching moment equilibrium, rolling and yawing moment equilibrium; design goals and trends to provide post-stall capability: agility

measures of merit, unsteady lift, thrust vector control, vortex control

- Experimental tools for preflight preparation: water tunnel tests and flow visualization tools, static wind tunnel tests, dynamic wind tunnel tests, rotary balance tests

Day Four

- Instrumentation for post-stall flight tests: sensors needed and their specifications; pre-test planning and preparation: data requirements, flight test team preparation and training, flight simulation; maneuver monitoring in real time for envelope expansion
- Emergency recovery devices: types of devices available, sizing and other design constraints, validation
- Subsystem modifications for post-stall testing: additional pilot restraint devices, control system modifications, propulsion system modifications
- Recommended recovery techniques; interpreting post-stall flight test results: analyzing real-time data, postflight analysis of data

Day Five

- Guidelines and discipline for conducting advanced flight tests: test team training, incremental buildup to critical conditions, use of simulation, independent review teams
- Planning for efficiency in data collection and data management: tailoring the scope of the tests to the requirement; identifying critical parts of the envelope; combining maneuvers and integration of backup test points; using all available tools: real-time monitoring, automated inserts; shared data processing between test site and home site
- Contingency planning: attrition of resources, backup support facilities, safety guidelines and documentation; course wrap-up and critique

Available as on-site course

Contact us for a no-cost, no obligation proposal for an on-site course:

Zach Gredlics
On-site Program Manager
E-mail aerosite@ku.edu
Phone 785-864-1066

Times/CEUs

Class time 33 hours

CEUs 3.3

Description

Provides practical knowledge needed to plan a series of flutter envelope expansion tests safely and comprehensively. Includes suggestions and recommendations for flutter and post-stall certification and demonstration of new or significantly modified airplane designs to meet civil or military requirements.

Target Audience

Designed for practicing and entry-level flight test engineers and managers, aircraft engineers and aircraft designers.

Fee

Includes instruction, a course notebook, *Introduction to Flight Test Engineering, Volumes I and II*, by Donald T. Ward, Thomas William Strganac and Rob Niewoehner, and a CD including *AGARD Report #776 Aircraft Dynamics at High Angles of Attack*

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Flight Tests and Aircraft Performance Track. See page 6.

AERODYNAMIC DESIGN IMPROVEMENTS: HIGH-LIFT AND CRUISE

Instructors: Case (C.P.) van Dam and Paul Vijgen

Location

Location San Diego, California

Date September 17–21, 2012

Course Number AA131090

Times/CEUs

Monday–Friday 8 a.m.–4 p.m.

Class time 35 hours

CEUs 3.5

Description

Covers recent advances in high-lift systems and aerodynamics as well as cruise drag prediction and reduction. Includes discussion of numerical methods and experimental techniques for performance analysis of wings and bodies and boundary-layer transition prediction/detection.

Target Audience

Designed for engineers and managers involved in the aerodynamic design and analysis of airplanes, rotorcraft and other vehicles.

Fee

\$2,395

Includes instruction, course notebooks, refreshments and five lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Aircraft Design Track. See page 6.

Day One

- Aircraft design and the importance of drag on fuel efficiency, operational cost and the environmental impact
- Empirical drag prediction including scale effects on aircraft drag and examples of drag estimates for several aircraft
- History of laminar flow for drag reduction
- Natural laminar flow design, application, certification and viability
- Laminar flow control, hybrid laminar flow control design and application considerations including suction system considerations
- CFD-based drag prediction and decomposition

Day Two

- Critical factors in CFD-based prediction
- Boundary-layer transition prediction and analysis ranging from empirical to Parabolic Stability Equation (PSE) and Direct Numerical Simulation (DNS) techniques
- Supersonic laminar flow including boundary-layer instability, transition mechanisms and control methods at supersonic speeds
- Wave drag reduction at transonic and supersonic conditions
- Passive and active methods for turbulent drag reduction

Day Three

- Induced-drag reduction ranging from classic linear theory to active reduction concepts including wingtip turbines and tip blowing
- Experimental techniques for laminar and turbulent flows

- Impact of high-lift on performance and economics of general aviation and subsonic transport aircraft
- Physics of single-element airfoils at high-lift including types of stall characteristics, Reynolds and Mach number effects

Day Four

- High-lift physics of swept and unswept single-element wings
- Physics of three-dimensional high-lift systems including features of 3D high-lift flows and lessons from high Reynolds number tests
- Importance of boundary-layer transition, relaminarization and roughness (icing, rain) effects on high-lift aerodynamics
- Overview and survey of high-lift systems; types of high-lift systems including support and actuation systems
- High-lift computational aerodynamics methods

Day Five

- Passive and active flow separation control
- Conceptual studies of high-lift systems including multi-disciplinary approaches
- High-lift characteristics of unconventional systems and configurations including canard and tandem-wing configurations, Upper Surface Blowing (USB), Externally Blown Flaps (EBF) and Circulation Control Wings (CCW)
- High-lift flight experiments involving general aviation and transport type airplanes
- Final observations

AEROMECHANICS OF THE WIND TURBINE BLADE (NEW)

Instructor: Thomas William Strganac

Day One | Fundamentals

- Definitions and nomenclature
- Similarity parameters and dimensional analysis
- Issues relevant to the wind turbine blade
- Winds and induced velocity
- Blade geometry and blade kinematics
- Wind-to-blade energy transfer

Day Two | Structures and Structural Vibrations

- Fundamentals in vibrations
- Fundamentals in structural dynamics and modal methods
- The rotating blade as a twisted non-uniform beam with flexure-flexure-torsion coupling
- The Campbell Diagram—frequency response vs. rotation speeds
- Multi-axis response and coupling unique to the blade
- Load sources: steady flow, nonuniform wind profiles, turbulence and gusts, gravity and inertia
- Design loads: wind classes, operation, ultimate, fatigue

Day Three | Aerodynamics

- Blade unsteady aerodynamics
- Gust fields, turbulence modeling
- Betz's elementary momentum theory (dynamic inflow)
- The blade profile (airfoil geometry), pressure vs. suction sides
- Reynolds number, Strouhal number, reduced frequency
- Steady, quasi-steady, unsteady approaches for motion-dependent loads
- Tip speed/freestream speed ratio

Day Four | Aeroelasticity

- Response vs. stability phenomena
- Vortex Induced Vibrations (VIV)
- Stall flutter
- Classical multi-mode flutter

Day Five | Special topics

- Control—variable vs. fixed speed, passive, yaw, torque speed, pitch and stall
- Nonlinear response—behavior and pathologies
- Tower interactions, wind-farm interactions (cascade flows)
- The wake and noise

Location

Location San Diego, California

Date September 10–14, 2012

Course Number AA131010

Times/CEUs

Monday–Thursday 8 a.m.–4 p.m.

Friday 8 a.m.–11:30 a.m.

Class time 31.5 hours

CEUs 3.15

Description

The course is presented from the perspective of the engineer interested in understanding the basics of wind turbine design and the underlying performance and technology issues. Topics will cover basic principles of wind energy conversion, rotor aerodynamics, the mechanics and performance of the wind turbine blade system, analysis and design issues, loads, passive control, modal methods, vibrations and aeroelasticity.

Target Audience

The course is intended for entry level engineers and technical project managers.

Fee

\$2,395

Includes instruction, a course notebook, refreshments and five lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Aircraft Design Track. See page 6.

A participant can expect to learn

- the basics of aerodynamics and structural dynamics as related to the wind turbine blade;
- the interaction of aerodynamic and structural dynamic loads on wind turbine blades;
- the effect of aeroelastic interactions on the design, response and stability of wind turbine blades;
- wind turbine modal dynamics and unique couplings.

AEROSPACE APPLICATIONS OF SYSTEMS ENGINEERING

Instructors: Donald T. Ward, Mark K. Wilson and D. Mike Phillips

Location

Location San Diego, California

Date September 10–14, 2012

Course Number AA131020

Times/CEUs

Monday–Friday 8 a.m.–4 p.m.

Class time 35 hours

CEUs 3.5

Description

Based on evolving systems engineering standards, EIA/IS 632 and IEEE P1220 and Version 3.2.1 of the *INCOSE Systems Engineering Handbook*. Provides a working knowledge of all elements, technical and managerial, involved in systems engineering as applied to aerospace systems of varying complexity. Concentrates on the most troublesome areas in systems development: requirements derivation, documentation, allocations, verification and control. Hardware and software systems case studies from several sectors of the aerospace industry will be used as systems development examples. Techniques have been used on many DoD and NASA programs and also are applicable to commercial and civilian projects.

Target Audience

Designed for systems engineers at all levels and program managers developing large or small systems.

Fee

\$2,395

Includes instruction, a course notebook, *INCOSE Systems Engineering Handbook*, DVD, refreshments and five lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Management and Systems Track. See page 6.

Day One

- Systems engineering: overview and terminology
- Generic system life cycles
- System hierarchy
- Systems of systems
- Value of systems engineering
- Life cycle stages and characteristics
- Tailoring concepts

Day Two

- Requirements: definition, elicitation and analysis
- Architectural design process
- Evolutionary acquisition, spiral development and open systems
- Implementation process
- Integration process
- Verification process
- Transition process
- Validation process
- Operation process
- Maintenance process
- Disposal process
- Cross-cutting technical methods

Day Three

- Project planning process
- Project assessment and control process
- Decision management process
- Risk management process
- Configuration management process
- Information management process
- Measurement process
- Acquisition process
- Supply process

- Life cycle model management process
- Infrastructure management process
- Project portfolio management process
- Human resource management process
- Quality management process
- Tailoring process

Day Four

- Integrated logistics support
- Cost effectiveness analysis
- Electromagnetic compatibility analysis
- Environmental impact analysis
- Interoperability analysis
- Life-cycle cost analysis
- Manufacturing and producibility analysis
- Mass properties engineering analysis
- Safety and health hazard analysis
- Sustainment engineering analysis
- Training needs analysis
- Usability analysis/human systems integration
- Value engineering
- Applying systems engineering in a “lean” environment (NASA X-38 case study)
- Class exercise

Day Five

- Software intensive systems engineering (lessons learned)
- Intensive systems engineering (case studies)
- Course summary and wrap-up

AIRBORNE EQUIPMENT DESIGN AND RTCA DO-160

Instructors: Ken Vranish and Ernie Condon

Day One

- History and background of why DO-160
- Explanation of aircraft environment
- Overview of DO-160
- Developing requirements to ensure DO-160 compliance in equipment designs
- Temperature and altitude
- Temperature variation
- Humidity
- Shock and crash safety
- Vibration
- Explosion proof

Day Two

- Waterproofness
- Fluids susceptibility
- Sand and dust
- Fungus resist
- Salt fog
- Icing
- ESD
- Flammability
- The aircraft atmospheric radiation environment

Day Three

- Magnetic effect
- Power input
- Voltage spike
- Audio frequency conducted susceptibility
- Induced signal susceptibility

Day Four

- RF susceptibility
- RF emission
- Lightning indirect susceptibility
- Lightning direct effects
- Review requirements development

Location

Location Orlando, Florida

Date November 6–9, 2012

Course Number AA131240

Times/CEUs

Tuesday–Friday 8 a.m.–4 p.m.

Class time 28 hours

CEUs 2.8

Description

This class is designed to educate system engineers, hardware design engineers and test engineers in the aspects of DO-160 as it pertains to the designs of airborne electronic equipment. For system and hardware engineers, the intent is to educate and empower them to develop equipment designs that are compliant with DO-160 by design and avoid expensive redesigns to correct issues found late in the development cycle during test. For test engineers, it is intended to assist them to properly develop test plans for their products.

Target Audience

This class is designed for system engineers responsible for developing requirements for airborne electronic equipment; hardware design engineers responsible for building such equipment and test engineers responsible for writing test plans.

Fee

\$2,095

Includes instruction, a course notebook, *DO-160 Environmental Conditions and Test Procedures for Airborne Equipment*, refreshments and four lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Avionics and Avionic Components Track. See page 6.

Contact Us. Obtain a no-cost, no-obligation proposal for an on-site course:

Zach Gredlics: On-site Program Manager
E-mail aerosite@ku.edu • Phone 785-864-1066

AIRCRAFT ICING: METEOROLOGY, PROTECTIVE SYSTEMS, INSTRUMENTATION AND CERTIFICATION

Instructors: Wayne R. Sand and Steven L. Morris

Location

Location Seattle, Washington

Date April 24–27, 2012

Course Number AA121430

Times/CEUs

Tuesday–Friday 8 a.m.–4 p.m.

Class time 28 hours

CEUs 2.8

Description

Covers meteorology and physics of aircraft icing; forecasting, finding and avoiding icing conditions; designing and evaluating ice protection systems and certification of aircraft for flight into known icing conditions.

Target Audience

Designed for aerospace engineers, flight test and design engineers, test pilots, line pilots, meteorologists, FAA engineers, Designated Engineering Representatives (DERs) and program managers.

Fee

\$2,095

Includes instruction, course and reference notebooks, refreshments and four lunches.

Certificate Track

This course is part of the Aerospace Compliance Track and the Aircraft Maintenance and Safety Track. See page 6.

Day One

- Icing hazard description
- Atmospheric aerosols
- Cloud physics of icing
- Ground icing, atmospheric cooling mechanisms
- Conceptual cloud modes: convective clouds, stratiform clouds
- Skew-T, Log P adiabatic diagrams

Day Two

- Icing environment analysis using Skew-T, Log P
- Assessment of icing potential
- Critical icing parameters, theory and measurements
- Meteorology of supercooled large drops
- Finding/avoiding icing conditions
- New and current icing research
- Internet resources

Day Three

- Ice accretion characteristics
- Effects of ice on aircraft performance
- Anti-ice systems
- De-ice systems
- Icing instrumentation, icing environment
- Icing detection

Day Four

- Effect of SLD on aircraft
- Engine icing considerations
- Ice-testing methods
- Certification and regulations
- Computational methods
- Review and discussion

A participant can expect to learn

- characteristics of ice accretion and the effects of icing on aircraft performance;
- methods for testing aircraft in icing conditions as well as computation methods to predict ice accretion;
- about supercooled liquid droplet icing and implications to aircraft operators and manufacturers;
- certification requirements and governing regulations addressing aircraft icing;
- about sources and application of Internet weather resources to icing encounters;
- by numerous examples of aircraft icing accidents and incidents.

“Instruction provides current information and techniques to predict, analyze, test and the installation of icing/weather equipment to aid in the safe and efficient certification of airplanes into icing environments. This course leaves you with a new appreciation of icing and the importance of detection and prevention.”

— Melissa Beaverson, Flight Test Engineer
Air Force Flight Test Center – USAF

AIRCRAFT LIGHTNING: REQUIREMENTS, COMPONENT TESTING, AIRCRAFT TESTING AND CERTIFICATION

Instructors: C. Bruce Stephens and Ernie Condon

This course may be taught by one or both instructors, based on their availability.

Day One

- Introduction
- The electromagnetic environment of aircraft
- Metallic and composite aircraft requirements
- Electromagnetic Interference (EMI)
- Electromagnetic Compatibility (EMC)
- Electrical bonding
- Electrostatic Discharge (ESD)
- Prescription Static (P-STATIC)
- High Intensity Radiated Fields (HIRF)
- FAA certification process and requirements

Day Two

- The lightning environment
- The history of lightning requirements for aircraft certification
- Aircraft lightning attachment
- Effects of lightning on aircraft
- Direct effects of lightning
- Direct effects testing
- RTCA/DO-160 levels for direct effects testing
- Direct effects certification requirements
- EASA requirements
- Simulation for direct effects requirements

Day Three

- Indirect effects of lightning
- Indirect effects aircraft level testing
- Indirect effects design
- RTCA/DO-160 levels for indirect effects bench testing
- Indirect effects certification requirements
- EASA requirements
- Simulation for indirect effects requirements

Day Four

- Fuel systems
- 14 CFR 25.981, Amendment 102
- Aircraft wiring and shielding
- Electrical Wiring and Installation System (EWIS)

Day Five

- Pre-selected teams will simulate the process of determining aircraft lightning certification and testing requirements for various components installed on the aircraft.
- Electromagnetic Effects (EME) program management
- Future EME testing techniques; Final EME discussion and questions

A participant can expect to learn

- electromagnetic effects requirements;
- FAA certification requirements for both part 23 and part 25 aircraft;
- DO-160 testing methods for indirect effects of lightning and direct effects of lightning;
- foreign HIRF/lightning certification requirements;
- fuel systems and Electrical Wiring and Installation System (EWIS) requirements.

Location

Location San Diego, California

Date September 10–14, 2012

Course Number AA131030

Times/CEUs

Monday–Thursday 8 a.m.–4 p.m.

Friday 8 a.m.–11:30 a.m.

Class time 31.5 hours

CEUs 3.15

Description

This course provides details for direct and indirect effects of aircraft lightning testing and certification. Requirements for both composite and metallic aircraft, including proper RTCA/DO-160 classifications, are examined.

The course will also include a high level overview of Electromagnetic Compatibility (EMC), High Intensity Radiated Fields (HIRF), Precipitation Static (P-Static) and Electrical Bonding requirements. The new requirements of Electrical Wiring and Installation System (EWIS) and Fuel Tank Safety (14 CFR 25.981 Amd. 102) will also be addressed.

Target Audience

This course is designed for all design engineering disciplines, project managers, project engineers and laboratory personnel whose aircraft system may require protection from the effects of lightning.

Fee

\$2,395

Includes instruction, a course notebook, refreshments and five lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Avionics and Avionic Components Track. See page 6.

AIRCRAFT STRUCTURAL LOADS: REQUIREMENTS, ANALYSIS, TESTING AND CERTIFICATION

Instructor: Wally Johnson

Locations

Location Seattle, Washington

Date April 23–27, 2012

Course Number AA121370

Location Orlando, Florida

Date November 5–9, 2012

Course Number AA131180

Times/CEUs

Monday–Thursday 8 a.m.–4 p.m.

Friday 8 a.m.–11:30 a.m.

Class time 31.5 hours

CEUs 3.15

Description

Provides an overview of aircraft structural external loads analysis, including: criteria, design, analysis, fatigue, certification, validation and testing. It covers FAR 23 and FAR 25 airplane loads requirements. However, the concepts may be applicable for military structural requirements.

Loads calculations examples using BASICLOADS software will be demonstrated throughout the course week. A copy of BASICLOADS software will be provided to attendees.

Target Audience

Designed for practicing engineers and engineering managers whose responsibilities include aircraft structures.

Fee

\$2,395

Includes instruction, a course notebook, a copy of BASICLOADS software, refreshments and five lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Aircraft Structures Track. See page 6.

Day One

- Introduction and overview of the course
- Basic aerodynamics overview
- Certification requirements (FAR 23, FAR 25, EASA, MIL SPECS)
- Mass properties calculations (design weights, weight-c.g. envelope development, weight-c.g. code, mass distribution code)
- Structural design airspeeds derivations (maneuver, gust penetration, cruise, dive, flap extended, design-airspeeds code)
- V-n diagrams (maneuver and gust load factors calculations, V-n diagram code)

Day Two

- Introduction to external loads (definitions, static vs. dynamic, flutter, loads classifications)
- Steady maneuvers (wind-up turn, pull-up, balancing tail loads derivations, bal-maneuver code)
- Pitch maneuvers analysis (abrupt pitch up, abrupt pitch down, checked pitch)
- Roll maneuver analysis

Day Three

- Yaw maneuver and engine out analysis
- Basic structural dynamics overview
- Static and dynamic gust analysis (gust load factor formula, tuned discrete 1-cos gust, PSD gust)

- Landing loads analysis (one wheel, two wheel, three wheel, landing code)
- Ground handling maneuver loads analysis (taxi, ground turn, nose-wheel yaw, braking, towing, jacking, ground-loads code)
- Fatigue loads analysis (normal operational conditions, missions, load spectra)

Day Four

- Wing loads analysis (design wing conditions, wing-load code)
- Horizontal tail loads analysis (HT loads certification requirements, design HT conditions)
- Vertical tail loads analysis (VT loads certification requirements, design VT conditions)
- Fuselage loads analysis (inertia loads, airloads, Ig shear curve, fuselage-loads code)
- Control surface and high-lift devices loads analysis (cert requirements, primary and secondary surfaces, flaps, spoilers, hinge moments, airload distributions)

Day Five

- Static and fatigue test loads
- Flight loads validation (ground loads calibration, in-flight loads measurements)
- Course summary and wrap-up

A participant can expect to learn

- the basics of aerodynamics, weights and structural dynamics;
- how the structural loads are developed;
- how the loads group interacts with other groups;
- commercial loads certification requirements;
- the various types of loads conditions;
- the loads flight and ground testing requirements.

AIRCRAFT STRUCTURES DESIGN AND ANALYSIS

Instructors: Michael Mohaghegh and Mark S. Ewing

This course may be taught by one or both instructors, based on their availability.



Day One

- Structural design overview: evolution of structural design criteria; FAA airworthiness regulations; structural design concepts, load paths
- Design requirements and validation of aircraft loads: materials and fasteners, flutter and vibrations, static strengths, durability and damage tolerance, crashworthiness, producibility, maintainability and environment/discrete events

Day Two

- Metals: Product forms, failure modes, design allowables testing, repeated loads; processing
- Fiber-reinforced composites: laminated composite performance; failure modes and properties; processing; moisture protection
- Material selection: aluminum, titanium, steel, composites and future materials; design exercise

Day Three

- Design to static strength: mechanical joints and fittings; bonded and welded joints; design exercise; highly loaded tension structures; combined loads

- Thin-walled structures: review of bending and torsion for compact beams; introduction to shear flow analysis of thin-walled beams; analysis exercise; semi-tension field beams; design exercise; introduction to the finite element method

Day Four

- Design to buckling and stiffness: buckling of thin-walled structures; design exercise
- Component design: wings and empennages, fuselage, landing gear, engine attachments, control surfaces

Day Five

- Design for damage tolerance: historical context of safe life, fail safety and damage tolerance; tolerating crack growth in structures; widespread damage; testing; inspection; design exercise
- Design for durability: fatigue, corrosion
- Design considerations: design for manufacture, design process management
- Certification: analysis and validation requirements, component and full-scale aircraft testing requirements
- Continued airworthiness: aging fleet, repairs

A participant can expect to learn

- primary requirements for certifiable structural design: static strength, durability and damage tolerance, and how these requirements impact design;
- to recognize the critical role validation plays in both design and analysis;
- to describe similarities and differences between composite and metallic structures;
- to compare and contrast classical analysis methods with FEA to determine the appropriate application.

Locations

Location Southern Maryland Higher Education Center
California, Maryland

Date June 4–8, 2012

Course Number AA121640

Location San Diego, California

Date September 10–14, 2012

Course Number AA131040

Times/CEUs

Monday–Friday 8 a.m.–4 p.m.

Class time 35 hours

CEUs 3.5

Description

Introduction to analysis and design of aircraft structures, including design criteria, structural design concepts, loads and load paths, metallic and composite materials; static strength, buckling and crippling, durability and damage tolerance; practical design considerations and certification and repairs. Analysis exercises and a design project are included to involve students in the learning process.

Target Audience

Designed for engineers, educators and engineering managers whose responsibilities include aircraft structures.

Fee

California, Maryland
\$1,895 with U.S. military ID
\$2,195 non-military

San Diego, California
\$2,395

Includes instruction, a course notebook and five lunches.

Certificate Track

This course is part of the Aircraft Structures Track. See page 6.

AIRPLANE FLIGHT DYNAMICS: OPEN AND CLOSED LOOP

Instructor: Willem A.J. Anemaat



Location

Location Southern Maryland Higher Education Center

California, Maryland

Date October 15–19, 2012

Course Number AA131510

Times/CEUs

Monday–Friday

8 a.m.–4 p.m.

Class time 35 hours

CEUs 3.5

Description

Overview of airplane static and dynamic stability and control theory and applications, classical control theory and applications to airplane control systems.

Target Audience

Designed for aeronautical, control system and simulator engineers, pilots with engineering background, government research laboratory personnel and educators.

Fee

SMHEC

\$1,895 with U.S. military ID

\$2,195 non-military

Includes instruction, *Airplane Flight Dynamics and Automatic Flight Controls, Parts I–II*; *Airplane Design, Parts IV, VI, and VII*; *Roskam's Airplane War Stories and Lessons Learned in Aircraft Design*, all by Jan Roskam, and five lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Flight Tests and Aircraft Performance Track and the Aircraft Design Track. See page 6.

Day One

- The general airplane equations of motion: reduction to steady state and to perturbed state motions; emphasis: derivation, assumptions and applications
- Review of basic aerodynamic concepts: airfoils—lift, drag and pitching moment, lift-curve slope, aerodynamic center; Mach effects; fuselage and nacelles—destabilizing effect in pitch and in yaw; wings, canards and tails—lift, drag and pitching moments; lift-curve slope; aerodynamic center; downwash; control power;
- Longitudinal aerodynamic forces and moments: stability and control derivatives for the steady state and for the perturbed state, example applications and interpretations

Day Two

- Lateral-directional aerodynamic forces and moments: stability and control derivatives for the steady state and for the perturbed state, example applications and interpretations
- Thrust forces and moments: steady state and perturbed state
- The concept of static stability: definition, implications and applications
- Applications of the steady state airplane equations of motion: longitudinal moment equilibrium, the airplane trim diagram (conventional, canard and flying wing), airplane neutral point, elevator-speed gradients, the nose-wheel lift-off problem; neutral and maneuver point (stick fixed)
- Applications of the steady state airplane equations of motion: lateral-directional moment equilibrium, minimum control speed with engine-out

Day Three

- Effects of the flight control system: reversible and irreversible flight controls; control surface hinge moments, stick and pedal forces, force trim; stick-force gradients with speed and with load factor; neutral and maneuver point stick free; effect of tabs—trim-tab, geared-tab, servo-tab, spring-tab; effect of down-spring and bob-weight; flight control system design considerations—reversible

and irreversible, actuator sizing and hydraulic system design considerations.

- Applications of the perturbed state equations of motion—complete and approximate longitudinal transfer functions; short period, phugoid, third mode, connections with static longitudinal stability, sensitivity analyses, equivalent stability derivatives; complete and approximate lateral-directional transfer functions—roll mode, spiral mode, Dutch roll mode and lateral phugoid, connections with static lateral-directional stability, sensitivity analyses, equivalent stability derivatives

Day Four

- Review of flying qualities criteria; MIL-F-8785C and FARs, Cooper-Harper ratings, relation to system redundancy and the airworthiness code
- Introduction to Bode plots, interpretations of Bode plots, airplane Bode plots, the root-locus method and the Bode method to synthesize control systems
- Introduction to human pilot transfer functions; analysis of airplane-plus-pilot-in-the-loop controllability; synthesis of stability augmentation systems—yaw dampers, pitch dampers; effect of flight condition, sensor orientation and servo dynamics

Day Five

- Synthesis of stability augmentation systems—yaw dampers, pitch dampers, α -feedback, β -feedback; effect of flight condition, sensor orientation and servo dynamics; basic autopilot modes; longitudinal modes—attitude hold, control-wheel steering, altitude hold, speed control and Mach trim; lateral-directional modes—bank-angle hold, heading hold, localizer and glide-slope control, automatic landing; coupling problems—roll-pitch and roll-yaw coupling, pitch rate coupling into the lateral-directional modes, nonlinear response behavior; effects of aeroelasticity—aileron reversal, wing divergence, control power reduction; effect of aeroelasticity on airplane stability derivatives; example applications—dependent switching

AIRPLANE PERFORMANCE: THEORY, APPLICATIONS AND CERTIFICATION (Computer-based Course)

Instructor: Jan Roskam, Mediated by Mario Asselin

This state-of-the-art course delivery features streaming video and animated illustrations. We are excited to present this dynamic learning opportunity featuring Jan Roskam and Mario Asselin.

Participants will be guided through course sections and will have the flexibility to complete the sections and readings at their own time and pace.

Interaction with the instructor and classmates takes place via threaded discussion and e-mail.

Course materials and log-in information is provided upon prepayment of the course fee. The course notes are for participants only and are not for sale. The course notebook and supplemental readings will be mailed upon receipt of payment.

Course Sections

Review of Airfoil Theory
 Review of Wing Theory
 Airplane Drag Breakdown
 Fundamentals of Stability and Control
 Class I Method for Stability and Control Analysis
 Fundamentals of Flight Performance
 Take-off Performance
 Landing Performance
 Climb and Drift-Down Performance
 Airplane Propulsion Systems
 Range, Endurance and Payload Range
 Sensitivity Studies and Growth Factors
 Maneuvering and the Flight Envelope
 Estimating Wing Area, Take-Off Thrust, Take-Off Power and Maximum Lift: Clean Takeoff and Landing
 Preliminary Configuration Design and Integration of the Propulsion System
 Flight Test Principles and Practices
 Airplane Life Cycle Program Costs

Bonus Material

Inertial Roll Coupling Lecture by Dr. Jan Roskam

Questions? For more information about this computer-based course, please contact:

Kim Hunsinger: Assistant Director
 E-mail kah@ku.edu • Phone 785-864-4758

Online Instruction

Available anytime

Class time 28 hours

CEUs 2.8

Description

Overview of airplane performance and prediction, performance applications, certification standards and the effects of stability and control on performance.

Target Audience

Designed for aeronautical engineers, pilots with an engineering background, simulator engineers, government research laboratory personnel and university faculty.

Fee

\$1,445 plus

\$45 (USD) shipping within the U.S.

\$110 (USD) shipping to Canada and international destinations

Includes online instruction, *Airplane Aerodynamics and Performance*, by C. Edward Lan and Jan Roskam and *Airplane Design, Parts I, II, and VII*, by Jan Roskam.

The course notes are for participants only and are not for sale.

The course texts and supplemental readings will be mailed upon receipt of payment.

Certificate Track

This course is part of the Flight Tests and Aircraft Performance Track. See page 6.

AIRPLANE PRELIMINARY DESIGN

Instructor: Willem A.J. Anemaat

Location

Location Dallas/Fort Worth, TX

Date March 5–9, 2012

Course Number AA121310

Times/CEUs

Monday–Friday 8 a.m.–4 p.m.

Class time 35 hours

CEUs 3.5

Description

Overview of the design decision-making process and relation of design to manufacturing, maintainability and cost-effectiveness. Applicable to jet transport, turboprop commuter transport, military (trainers, fighter bomber, UAV) and general aviation aircraft.

Target Audience

Designed for aeronautical engineers, pilots with some engineering background, government research laboratory personnel, engineering managers and educators.

Fee

\$2,395

Includes instruction, *Airplane Aerodynamics and Performance* by C. Edward Lan and Jan Roskam, *Airplane Design, Parts I–VIII, Lessons Learned in Aircraft Design* and *Roskam's Airplane War Stories*, all by Jan Roskam, refreshments and five lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Aircraft Design Track. See page 6.

Day One

- Review of drag polar breakdown for subsonic and supersonic airplanes, rapid method for drag polar prediction, check of drag polar realism; review of fundamentals of flight mechanics: take-off and landing characteristics, range, endurance and maneuvering, the payload-range diagram
- Preliminary sizing of airplane take-off weight, empty weight and fuel weight for a given mission specification: applications; sensitivity of take-off weight to changes in payload, empty weight, range, endurance, lift-to-drag ratio and specific fuel consumption; role of sensitivity analyses in directing program-oriented research and development: applications
- Performance constraint analyses: relation between wing loading and thrust-to-weight ratio (or wing loading and weight-to-power ratio) for the following cases: stall speed, take-off field length and landing field length, statistical method for estimating preliminary drag polars, review and effect of airworthiness regulations; relation between wing loading and thrust-to-weight ratio (or wing loading and weight-to-power ratio) for the following cases: climb and climb rate (AEO and OEI), cruise speed and maneuvering; the matching of all performance constraints and preliminary selection of wing area and thrust required: applications

Day Two

- Preliminary configuration selection; what drives unique (advanced) configurations? Discussion of conventional, canard and three-surface configurations; fundamentals of configuration design, step-by-step analysis of the feasibility of configurations: applications
- Fundamentals of fuselage and wing layout design; aerodynamic, structural and manufacturing considerations; effect of airworthiness regulations
- High-lift and lateral control design considerations; handling quality requirements; icing effects; layout design of horizontal tail, vertical tail and/or canard; static stability and control considerations; the X-plot and the trim diagram; stable and unstable pitch breaks; effect of control power nonlinearities; icing effects

Day Three

- Fundamentals of powerplant integration: inlet sizing, nozzle configuration, clearance envelopes, installation considerations, accessibility considerations, maintenance considerations; effect of engine location on weight, stability and control; minimum control speed considerations
- Fundamentals of landing gear layout design; tip-over criteria; FOD considerations; retraction kinematics and retraction volume; take-off rotation
- Class I weight and balance prediction; the c.g. excursion diagram; Class I moment of inertia prediction; importance of establishing control

over weight; preliminary structural arrangement for metallic and composite airframes; manufacturing and materials considerations

- V-n diagram
- Class II weight, balance and moment of inertia prediction
- Fundamentals of static longitudinal stability; the trim diagram, trim considerations for conventional, canard and three-surface designs, tail and canard stall

Day Four

- Deep stall and how to design for recoverability, effects of the flight control system; control force versus speed and load factor gradients; flying quality considerations; additional stability and control considerations; effect of flaps; minimum control speed with asymmetric thrust
- Take-off rotation and the effect of landing gear location
- Review of dynamic stability concepts and prediction methods; short period, phugoid, spiral roll and Dutch roll modes; flying quality criteria: before and after failures in flight crucial systems; the role and limitations of stability augmentation; review of control surface sizing criteria: trim, maneuvering and stability augmentation; initial system gain determination; sensitivity analyses and their use in early design decision making; flight control system layout and design considerations; mechanical and hydraulically powered flight controls; layout design considerations for redundant “flight-critical” systems: architectures associated with various types; safety and survivability considerations
- Airworthiness code
- Fundamental considerations in fuel system layout design; sizing criteria; some do’s and don’ts; layout and design considerations for “other” systems: de-icing, water and waste water

Day Five

- Landing gear design revisited, shock absorber design, structural integration of the landing gear, some do’s and don’ts
- Factors to be considered in estimation of: research and development cost and manufacturing and operating cost; the concept of airplane life cycle cost: does it matter in commercial programs? Discussion of 81 rules for “design for low cost”; the break-even point, estimation of airplane “net worth” and its effect on program decision making; other factors in airplane program decision making, finding a market niche, risk reduction through technology validation, design to cost; lessons learned in past programs: do we really learn them?
- Examples of sizing (weights, performance, drag, lift) using the Advanced Aircraft Analysis (AAA) software. Examples of weight and balance using AAA

AIRPLANE SUBSONIC WIND TUNNEL TESTING AND AERODYNAMIC DESIGN

Instructor: Willem A.J. Anemaat

Day One

- Introduction to wind tunnel testing
- Wind tunnel facilities
- Measurements: what to measure and how
- Calibration
- Forces and moments measurements
- Pressure measurements
- Flow visualization
- Model design
- Scale effects
- Test plan setup

Day Two

- Trip strips
- Changes to the test plan
- Test management
- Model changes
- Lift
- Drag
- Pitching moment
- Downwash
- Stall
- Deep stall

- Longitudinal stability and control
- Directional stability and control
- Lateral stability and control
- Ground effects
- Propellers/power effects

Day Three

- Airfoils
- Wings
- Flaps
- Landing gears
- Winglets
- Dorsal fins
- Ventral fins
- Nacelles
- Inlets
- T-strips
- Brakes and spoilers
- Miscellaneous components
- Component build-up
- Scaling forces and moments to full scale
- Other tests
- Summary

Location

Location Orlando, Florida

Date November 6–8, 2012

Course Number AA131220

Times/CEUs

Tuesday–Thursday 8 a.m.–4 p.m.

Class time 21 hours

CEUs 2.1

Description

This course deals with wind tunnel test specifics on how to set up a test, how to run tests, what is involved with testing from a test management and engineering point of view, how to design the test models and what it is used for in the aerodynamic design of airplanes. The course deals with data analysis and how to correct it to full-scale airplanes.

Target Audience

Aeronautical engineers, researchers, government research laboratory personnel, engineering managers and educators who are involved with research, development and design of subsonic aircraft or modifications to aircraft.

Fee

\$1,795

Includes instruction, a course notebook, *Low-Speed Wind Tunnel Testing*, third edition, by Jewel B. Barlow, William H. Rae, Jr., and Alan Pope, refreshments and three lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Aircraft Design Track. See page 6.

A participant can expect to learn

- how to design a wind tunnel test;
- how to run a wind tunnel test;
- how to analyze wind tunnel data;
- how to correct wind tunnel data to full scale;
- how to fix aerodynamic problems.

APPLIED NONLINEAR CONTROL AND ANALYSIS

Instructor: Bill Goodwine

Location

Location Orlando, Florida

Date November 5–9, 2012

Course Number AA131190

Times/CEUs

Monday–Friday 8 a.m.–4 p.m.

Class time 35 hours

CEUs 3.5

Description

This course covers analysis methods for nonlinear dynamical systems with the primary applications to feedback control. It is particularly designed for control engineers who are facing challenges due to more tightly integrated systems and systems governed by controllers with switching behavior or logic. The nonlinear control applications covered are overviews of describing functions, the direct Lyapunov method, the Lur'e problem and circle criterion, the small gain theorem, adaptive control, feedback linearization (dynamic inversion) and hybrid systems. The theoretical content, which is the basis for understanding the control applications, consists of identifying nonlinear phenomena, the process and theory of linearization, Lyapunov stability, boundedness, center manifold theory and bifurcations. The supplied CD contains MATLAB programs that can be used as the basis for hands-on exercises.

Target Audience

This course would be appropriate for managers and engineers who work in the analysis and design of modern control systems.

Fee

\$2,395

Includes instruction, a course notebook, CD, refreshments and five lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Flight Control Systems Design Track. See page 6.

Day One

- Identifying nonlinear phenomena such as multiple equilibria, bifurcations, chaos, nonunique and multiple solutions, limit cycles, finite escape time, sub- and super-harmonic response
- Nomenclature and definitions
- The theory and process of linearization
- The method of harmonic balance
- Introduction to describing functions

Day Two

- Describing functions examples
- Nonlinear stability and Lyapunov functions
- Control and the direct Lyapunov method
- Methods for determining Lyapunov functions

Day Three

- The Lur'e problem, circle criterion and Popov criterion
- The small gain theorem and applications
- Stability of nonlinear nonautonomous systems and boundedness

Day Four

- Feedback linearization
- Center manifold theory and stability
- Bifurcation theory

Day Five

- Introduction to hybrid (switching) systems
- Stability of hybrid systems under arbitrary switching
- Stability of hybrid systems under controlled switching
- Stability of hybrid systems under state-dependent switching

A participant can expect to learn to

- identify nonlinear phenomena in the dynamics of physical systems;
- apply the basic tools of Lyapunov stability theory to determine the stability of nonlinear systems;
- use describing functions to determine the existence of limit cycles;
- apply methodologies from adaptive control;
- understand and apply tools for the analysis of center manifolds and bifurcating systems;
- apply methods for the analysis of hybrid and switching systems.

AVIATION WEATHER HAZARDS

Instructor: Wayne R. Sand

Day One

- Thunderstorms and strong convective clouds: basic conceptual models, single-cell storms, multi-cell storms and line storms
- Stability and instability, storm tops and vertical motion
- Turbulence: causes and results, intensity, tornadoes
- Lightning: causes and results, composite aircraft, lightning detection networks
- Heavy rain: raindrops and drop sizes, precipitation intensity, effects on performance
- Radar: airborne weather radar, WSR-88D (NEXRAD), Stormscope
- Hail: mechanisms to develop hail, visual and radar detection

Day Two

- Windshear: physics of microbursts, stability and instability, precipitation loading, evaporation, dry and wet microbursts
- Gust fronts: thunderstorm generated, cold fronts, structure
- Windshear training aid: detection signals, flight crew actions
- Clear air turbulence: jet stream, thunderstorm wake, instability, waves, deformation zones
- Detection Systems: Terminal Doppler Weather Radar, Low-Level Windshear Alert Systems, airborne forward-look systems, airborne in situ systems, integrated terminal weather information system
- Accidents: discussion of key accidents

Day Three

- Basic icing physics: supercooled liquid water content, droplet sizes, temperature
- Intensity and character: light, moderate and severe; continuous and intermittent; collection efficiency; rime, clear and mixed
- Icing forecasts: NWS forecasts; experimental forecasts; cloud type forecasts, cumuliform (max intermittent) and stratiform (max continuous); orographic influence
- Aircraft performance effects: de-iced and anti-iced aircraft; unprotected components; lift, drag, weight and climb considerations; pilot action considerations
- Icing sensors, in situ, remote, passive
- Detailed sensors for certification: supercooled liquid water content, droplet sizes, temperature
- How to find and/or avoid icing conditions

Day Four

- Mountain weather: differential heating, mountain and valley winds, channeling winds, thunderstorms, waves, rotors, density altitude
- Low ceiling and visibility: fog, various types; snow, rain; low ceilings; conditional forecasts, chance and occasional
- Weather-related accident statistics: problem areas, NTSB and AOPA statistics, specific accident discussions
- New systems: ASOS, GOES, ADDS, AFSS, data link, rapid update cycle, new display and depiction concepts, air traffic controller weather, others
- Review and questions

Available as on-site course

Contact us for a no-cost, no obligation proposal for an on-site course:

Zach Gredlics
On-site Program Manager
E-mail aerosite@ku.edu
Phone 785-864-1066

Times/CEUs

Class time 28 hours

CEUs 2.8

Description

Examines the key weather hazards that affect all of aviation and provides an in-depth understanding of the most serious aviation weather hazards faced by all aspects of aviation. Materials and instruction are designed to provide enough depth to enable pilots to make preflight and in-flight weather-related decisions intelligently. Designed to provide flight test and design engineers the basic information necessary to consider weather factors when designing aircraft and aircraft components. Flight dispatchers also will gain insight into aviation weather hazards, which should substantially enhance their ability to make weather-related decisions.

Target Audience

Designed for pilots, test pilots, meteorologists, flight test engineers, design engineers, dispatchers, RPV designers and operators, government and research laboratory personnel and educators.

Fee

Includes instruction and course notebook.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Aircraft Maintenance and Safety Track. See page 6.

CERTIFICATION ENGINEERING OF UTILITY-SCALE WIND TURBINES (NEW)

Instructor: Kyle K. Wetzel

Location

Location Dallas/Fort Worth, Texas

Date March 6–9, 2012

Course Number AA121360

Times/CEUs

Tuesday–Friday 8 a.m.–4 p.m.

Class time 28 hours

CEUs 2.8

Description

The course will present current wind turbine industry standard practice for engineering and certifying utility-scale wind turbines. Topics will include current state-of-the-art in turbine configurations and operations, international standards governing wind turbines, best engineering practices, methods of dynamic simulations and loads analysis, rotor blade aerodynamic and structural design, drivetrain design, electrical systems engineering, controls system design, tower design.

Target Audience

Engineering managers (VPs of engineering, chief engineers, project engineers) and system engineers for entities wanting to enter the wind turbine industry.

Fee

\$2,095

Includes instruction, a course notebook, a CD, refreshments and four lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Aircraft Design Track. See page 6.

Day One

- General engineering of wind turbines
- General principals of wind turbine operation
- Basic layout and operation of a wind turbine
- Standard terminology, coordinate systems
- Overview of aerodynamic principles
- Variable speed vs. fixed speed operation
- Pitch and stall regulation
- General methods of turbine engineering design and analysis
- International standards governing turbine engineering
- Best practices
- Process for certification of turbines
- Historical evolution of turbine technology and current state of the art

Day Two

- Loads analysis
- Principles of loads analysis
- Design load cases
- Wind inflow modeling
- Overview of atmospheric conditions
- Extreme wind conditions
- Turbulent wind conditions
- Turbine modeling
- Critical modules in the turbine model (turbine, tower, blades, etc.)
- Post-processing of loads
- Key load components and their applications
- Extreme loads, cyclic loads, Markov matrices, damage equivalent loads, “Revs at Levs”
- Methods of post-processing
- Requirements for certification of loads
- Loads testing

Day Three

- Rotor blades
- General methods of rotor blade engineering design and analysis
- International standards governing rotor blade engineering

- Best practices
 - Process for certification of blades
 - Principles of rotor blade aerodynamics
 - Typical airfoils and characteristics
 - Aerodynamic optimization of variable-speed, pitch regulated blades
 - Structural design and optimization
 - Typical approaches to structural design and manufacturing
 - Typical materials and processes
 - Structural optimization and consideration of design drivers
 - Finite element analysis of blades
 - Typical failure modes
 - Manufacturing of rotor blades
 - Typical processes employed in the industry
 - Quality assurance; typical defects and solutions
 - Testing of rotor blades
 - International standards for testing
 - Industry standard test protocols and procedures
 - Test facilities and requirements
 - Results and their use
- ## Day Four
- Controls, dynamics, drivetrain and testing
 - Control of wind turbine systems
 - Pitch regulation and pitch system design
 - Stall regulation
 - Torque-speed scheduling
 - Dynamics of wind turbine systems
 - Instabilities
 - Campbell diagrams
 - Tuning of wind turbine systems and controls
 - Drivetrain design
 - Drivetrain layout
 - Wind turbine gearbox engineering
 - Electrical systems engineering
 - Testing of wind turbines
 - Test standards and protocols
 - Best practices for testing wind turbines

COMMERCIAL AIRCRAFT SAFETY ASSESSMENT AND 1309 DESIGN ANALYSIS

Instructor: Marge Jones

Day One

- System safety basics including accident statistics/ data, system safety vs. reliability concepts, certification risk assessment criteria and fail safe and system safety order of precedence
- Overview of the SAE ARP 4761 Safety Assessment process for commercial aviation
- Aircraft and System Functional Hazard Assessments including class exercise
- Overview of the SAE ARP 4754A Development Process focused to capture, validation, and verification of safety requirements using safety assessment techniques

Day Two

- System architecture concepts, modeling failure conditions from proposed architecture, and assigning development assurance levels including SAE ARP 4754A *Guidelines for Development of Civil Aircraft and Systems*
- Preliminary System Safety Assessments and allocating safety requirements including common mode mitigations and physical safety requirements (zonal).
- Tailoring the safety process for modifications (STCs)

Day Three

- Failure rate prediction techniques and class exercise
- Failure Mode and Effects Analysis (FMEA)/ Failure Mode Effects Summary (FMES)
- Fault Tree Analysis (FTA) concepts, modeling techniques and examples, calculating probabilities, importance measures and software tools
- Class FMEA and FTA exercise

Day Four and Day Five

- Common cause analysis: particular risk, zonal and common mode
- System safety assessment
- Examining the 1309 regulation and specific aspects of safety process that is used to show compliance to the regulation

Location

Location Seattle, Washington

Date April 23–27, 2012

Course Number AA121380

Location San Diego, California

Date September 10–14, 2012

Course Number AA131050

Times/CEUs

Monday–Thursday 8 a.m.–4 p.m. • **Friday** 8 a.m.–11:30 a.m.

Class time 31.5 hours

CEUs 3.15

Description

Covers system safety requirements of 14 CFR 23.1309, 25.1309, 27.1309 and 29.1309 from fundamental philosophies and criteria to the analysis techniques to accomplish safety requirement identification, validation and verification. Includes detailed review of SAE ARP 4761 and system safety related aspects of ARP 4754A including allocation of safety requirements and assigning development assurance levels. Class exercises include Functional Hazard Assessment, Preliminary System Safety Assessments, Failure Rate Prediction, Failure Mode and Effects Analysis, and Fault Tree Analysis. Principles apply to all types of commercial aircraft certification and may also be adapted for any system safety activity.

Target Audience

Designed for Parts 23, 25, 27 and 29 system certification engineers, system designers, FAA Designated Engineering Representatives (DERs), aircraft certification personnel, system safety specialist new to commercial certification safety process and military personnel procuring civil equipment.

Fee

\$2,395

Includes instruction, a course notebook, *SAE ARP 4754A—Guidelines for Development of Civil Aircraft and Systems*, *SAE ARP 4761—Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment*, reference materials, refreshments and five lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Aerospace Compliance Track and the Aircraft Maintenance and Safety Track. See page 6.

COMPLEX ELECTRONIC HARDWARE DEVELOPMENT AND DO-254

Instructors: Jeff Knickerbocker and Leanna K. Rierson

This course may be taught by either instructor, based on his or her availability.

Location

Location San Diego, California

Date September 17–19, 2012

Course Number AA131080

Times/CEUs

Monday–Wednesday 8 a.m.–4 p.m.

Class time 21 hours

CEUs 2.1

Description

This course provides the fundamentals of developing and assessing electronic components to the standard RTCA/DO-254 Design Assurance Guidance for Airborne Electronic Hardware. It is designed for developers, avionics engineers, systems integrators, aircraft designers and others involved in development or implementation of complex electronic hardware (Application Specific Integrated Circuits, Field-Programmable Gate Arrays, etc.). The course also provides insight into the FAA's review process and guidance and provides practical keys for successful development and certification. Practical exercises and in-class activities will be used to enhance the learning process.

Target Audience

Designed for developers, avionics engineers, systems integrators, aircraft designers and others involved in development or implementation of complex electronic hardware and programmable devices (Application Specific Integrated Circuits, Field-Programmable Gate Arrays, etc.).

Fee

\$1,795

Includes instruction, course notebook, *RTCA/DO-254 Design Assurance Guidance for Airborne Electronic Hardware*, refreshments and three lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Avionics and Avionic Components Track. See page 6.

Day One

- Introductions and background
- History and overview of DO-254
- FAA's advisory material
- Complex electronic technology
- Framework of DO-254
- Planning process
- Development process

Day Two

- Validation and verification
- Configuration management
- Process assurance (a.k.a. quality assurance)
- Certification liaison process
- Tools

Day Three

- Firmware vs. software vs. hardware
- Microprocessor assurance
- Simple vs. complex
- Structural coverage
- What to expect from certification authorities
- Challenges in complex hardware development and certification
- Summary

Enroll in this course and Integrated Modular Avionics and DO-297 (see page 44).

Save money! The cost for the two courses combined is \$2,395.

A participant can expect to

- develop and document efficient RTCA/DO-254 compliant processes;
- create, capture and implement compliant requirements design data;
- generate and adhere to effective validation and verification strategies;
- evaluate compliance to RTCA/DO-254;
- understand FAA's policy and guidance.

CONCEPTUAL DESIGN OF UNMANNED AIRCRAFT SYSTEMS

Instructor: Armand Chaput, Bill Donovan or Richard Colgren

This course may be taught by any of the above instructors, based on his availability.

Day One

- Course introduction
- Introduction to UAS
- UAS conceptual design issues
- Fundamentals of system design
- UAS operating environments
- Sortie rate estimates

Day Two

- Requirements analysis
- Control station considerations and sizing
- Communication considerations/ sizing
- Payload (EO/IR and radar) considerations and sizing
- Reliability, maintainability and support
- Life cycle cost
- Decision making

Day Three

- Air vehicle parametric design
- Conceptual level aerodynamics
- Standard atmosphere models
- Parametric propulsion

Day Four

- Mass properties
- Parametric geometry
- Air vehicle performance
- Mission assessment
- Methodology and correlation

Day Five

- Air vehicle optimization
- Overall system optimization
- Class design presentation

A participant can expect to learn to

- design and analyze overall unmanned aircraft systems;
- estimate sensor size and performance and impact on overall system performance;
- understand basic elements of UAS communications and know how to estimate overall communication system size and power requirements;
- develop overall concepts of cooperation and assess impacts of sortie rate and supportability;
- understand key air vehicle configuration drivers, how to estimate aero/propulsion/weight/stability, overall air vehicle performance, size and tradeoffs.

“A very comprehensive and valuable introduction to conceptual design of unmanned aircraft.”

—Daniel Cobo-Vuilleumier - Unmanned Aircraft Systems Engineer and Airworthiness Manager, 2010 Orlando Attendee

Available as on-site course

Contact us for a no-cost, no obligation proposal for an on-site course:

Zach Gredlics

On-site Program Manager

E-mail aerosite@ku.edu

Phone 785-864-1066

Times/CEUs

Class time 31.5 hours

CEUs 3.15

Description

Conceptual approach to overall design of Unmanned Aircraft (UA) Systems (UAS) includes concepts of operations, communications, payloads, control stations, air vehicles and support. Includes requirements and architecture development, initial sizing and conceptual level parametric and spreadsheet assessment of major system elements.

Target Audience

Designed primarily for practicing conceptual level design engineers, systems engineers, technologists, researchers, educators and engineering managers. Students should have some knowledge of basic aerodynamics and conceptual design, although it is not mandatory. Basic knowledge of spreadsheet analysis methods is assumed.

Fee

Includes instruction and course notebook.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Aircraft Design Track. See page 6.

DIGITAL FLIGHT CONTROL SYSTEMS: ANALYSIS AND DESIGN

Instructor: David R. Downing

Available as on-site course

Contact us for a no-cost, no obligation proposal for an on-site course:

Zach Gredlics

On-site Program Manager

E-mail aerosite@ku.edu

Phone 785-864-1066

Times/CEUs

Class time 35 hours

CEUs 3.5

Description

This course presents a set of classical and modern flight control analysis and design tools. These tools will be combined to form a design process that will enable the development of flight control systems that are implementable in “real world” vehicles. These techniques will be used to design typical aeronautical vehicles’ lateral and longitudinal controllers.

Target Audience

Designed for individuals from government or industry who design, simulate, implement, test or operate digital flight control systems or who need an introduction to classical and modern flight control concepts.

Fee

Includes instruction and a course notebook.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Flight Control Systems Design Track. See page 6.

Day One

Introduction and Problem Definition, Flight Dynamics: development of non-linear equations of motion, development of linear equations of motion, standard trim conditions, development of stability and control derivatives, Classical Design of Continuous Controllers Using SISO Tools: problem definition, Laplace Transforms, complex plane analysis of linear SISO systems, analysis of closed loop SISO systems, compensators, frequency response of linear 1st and 2nd order systems, Bode diagrams, system identification, design of SISO closed loop control systems

Day Two

Classical Design of Continuous Controllers Using SISO Tools (cont’d): Design of typical continuous lateral and longitudinal control modes for continuous MIMO vehicles, implementation of perturbation controllers in non-linear MIMO vehicles. Classical Design of Sampled Data Controllers Using SISO Tools: problem definition, develop models of sampler and ZOH, complex plane analysis of linear SISO sampled data systems, analysis of closed loop SISO sampled data systems, z-plane compensators, design of typical sampled data lateral and longitudinal control modes for continuous MIMO vehicles, implementation of perturbation controllers in non-linear MIMO vehicles

Day Three

Modern Design of Continuous MIMO Controllers: analysis of MIMO systems, development of continuous Linear Quadratic Regulator, weighting matrix selection, non-zero set point problem, proportional integral structure, control rate weighting structure, PIF structure, comparison of PIF and PID control structures, design of typical lateral and longitudinal control modes for continuous MIMO vehicles using modern techniques

Day Four

Modern Design of Sampled Data MIMO Controllers: development and analysis of digital MIMO systems, development of discrete and sampled data Linear Quadratic Regulator, weighting matrix selection, non-zero set point problem, proportional integral structure, control rate weighting structure, PIF structure, design of typical sampled data lateral and longitudinal control modes for MIMO vehicles using modern techniques

Day Five

Output Feedback for Sampled Data Controllers: development of output feedback design techniques, command generator tracker, output feedback-PIF-CGT MIMO sampled data controllers, design of typical sampled data lateral and longitudinal control modes for MIMO vehicles using output feedback techniques

A participant can expect to

- review of flight dynamics to highlight the key features of aircraft dynamics;
- review Classical Single Input/Single Control Design Techniques in both the Laplace Domain and the Frequency Domain
- Introduce Modern Multi-Input/Multi-Output Linear Quadratic Regulator Design Technique
- Incorporate desirable Classical Controller features into the Linear Quadratic Regulator Optimization Problem by defining new state variables, enhanced command structures and state estimation techniques.
- Apply the Classical and Modern Design Techniques to design aircraft flight control systems that can be implemented in the real world.

DURABILITY AND DAMAGE TOLERANCE CONCEPTS FOR AGING AIRCRAFT STRUCTURES (Computer-based Course)

Instructor: John Hall

Topics

- Background to current aging airplane programs
- Design objectives: safety, economics and responsibilities
- Damage sources: environmental deterioration, accidental and fatigue damage
- Evaluation: loads, stresses, detail design, analysis and testing
- Manufacture: processes and assembly
- Certification: fatigue and damage tolerance
- Maintenance: inherent characteristics and operator responsibilities
- Aging airplane programs: introduction, modifications, repairs, corrosion prevention and control, fatigue and widespread cracking, structural maintenance program guidelines
- Future airplanes: design and analysis, MSG-3-Revision 2

Attendees will have the ability to communicate with the instructor.

A discussion board will be available for attendees to communicate with each other.

Questions? For more information about this computer-based course, please contact:

Kim Hunsinger: Assistant Director
E-mail kah@ku.edu • Phone 785-864-4758

A participant can expect to better understand

- basic aging airplane programs, including:
 - modifications
 - repairs
 - corrosion prevention control
 - fatigue (SSID/DTR)
 - widespread fatigue cracking
- the potential effects of airplane aging on structural maintenance, including:
 - applicable design
 - evaluation
 - testing
 - manufacturing
 - certification procedures
 - maintenance procedures developed and used by operators and airplane manufacturers

Online Instruction

Available anytime

Course Number AA121460

Class time 19 hours

CEUs 1.9

Description

Design, analysis and testing fundamentals are used as an introduction to the effects of fatigue, accidental and corrosion damage on the durability and damage tolerance of aircraft structure. Emphasis is placed on current programs used to assure continuing airworthiness of aging aircraft structure. Principal topics are centered on commercial jet transport aircraft, but fundamentals are applicable to all types of aircraft.

Target Audience

Designed for managers, engineers, maintenance and regulatory personnel in the aircraft industry who are involved in the evaluation, certification, regulation and maintenance of aging aircraft structure.

Fee

\$1,195

\$35 (USD) shipping within the U.S.

\$95 (USD) shipping to Canada and other international locations.

Includes online instruction and course notebook.

The course notes are for participants only and are not for sale.

The course notebook and supplemental readings will be mailed upon receipt of payment.

Certificate Track

This course is part of the Aircraft Maintenance and Safety Track. See page 6.

FAA CERTIFICATION PROCEDURES AND AIRWORTHINESS REQUIREMENTS AS APPLIED TO MILITARY PROCUREMENT OF COMMERCIAL DERIVATIVE AIRCRAFT/SYSTEMS

Instructors: Gilbert L. Thompson and Robert D. Adamson

This course may be taught by either instructor, based on his availability.

Location

Location Dallas/Fort Worth, Texas

Date March 6–8, 2012

Course Number AA121350

Location San Diego, California

Date September 11–13, 2012

Course Number AA131070

Times/CEUs

Tuesday–Thursday 8 a.m.–4 p.m.

Class time 21 hours

CEUs 2.1

Description

Overview of FAA functions and requirements applicable to Type Design Approval, Production Approval, Airworthiness Approval and Continued Airworthiness associated with military procured commercial derivative aircraft and products. Course will focus on the unique military needs in procurement (customer versus contractor) of products meeting civil airworthiness requirements which are aligned with military-specific mission/airworthiness goals.

Target Audience

Designed, and focused in scope, specifically for U.S. Department of Defense (DoD), Department of Homeland Security, U.S. Coast Guard and non-U.S. military procurement and airworthiness personnel, and associated military/supplier engineers, consultants and project directors involved in procurement of commercial derivative aircraft (CDA) or equipment developed for use on CDA.

Fee

\$1,795

Includes instruction, a course notebook, CD, refreshments and three lunches. The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Aerospace Compliance Track. See page 6.

Day One

- Review of course content and class exercise
- Overview of FAA Aircraft Certification (AIR) and Flight Standards (AFS) service organizations as they relate to military use of commercial derivative aircraft/systems
- Applicability of FAA Advisory Circulars, Notices and Orders
- FAA “baseline” and “Project Specific Service Agreement” (PSSA) services following Title 14, Code of Federal Regulations (CFR), Parts 1, 11, 21
- Parts Manufacturer Approval (PMA) process
- Technical Standard Order Authorization (TSOA) process
- Airworthiness Standards Parts 23, 25, 26, 27, 29 and 33
- Part 183, Representatives of the Administrator, including Subpart D, Organization Designation Authorization (ODA)

Day Two

- Part 43 Maintenance, Preventive Maintenance, Rebuilding and Alteration
- Eligibility of Department of Defense (DoD)/DoD contractor installations and modification centers as FAA Part 145 Repair Stations
- Part 39 Airworthiness Directives
- Flight Standards Aircraft Evaluation Group’s (AEG) role in aircraft certification
- Special conditions, equivalent level of safety and exemption process and issuance
- Type Certification (TC) and Supplemental Type Certification (STC) process (FAA Handbook 8110.4)

- Utilizing FAA and Industry Guide to Product Certification, specifically Project-Specific Certification Plan (PSCP) principles in the Request for Proposal (RFP) process
- Impact of FAA Safety Management practices
- FAA Form 337/Field Approval process

Day Three

- Type Certification Data Sheets (TCDS)
- Impact of Part 36, Noise Standards
- Airworthiness Directive (AD) process applied to CDA
- Bilateral Aviation Safety Agreements (BASA) and European Aviation Safety Agency (EASA)
- Impact of DoD acquisition policies as exemplified by USAF Policy Directives 62-6, NAVAIR Instruction 13100.15 and Army Regulation 70-62
- Memorandum of Agreement/ Interagency Support Agreement between DOT/FAA and Armed Services of the United States
- Comparison of DoD/FAA airworthiness processes; application of MIL-HDBK-516B, Airworthiness Certification Criteria; development of TACC/MACC
- Role of the FAA Military Certification Office (MCO)
- FAA Order 8110.101, Type Certification Procedures for Military Commercial Derivative Aircraft
- Certification options for CDA; use of FAA Form 8130-31, Statement of Conformity–Military Aircraft
- AC20-169, Guidance for Certification of Military and Special Missions Modifications and Equipment for Commercial Derivative Aircraft (CDA)

FAA CONFORMITY, PRODUCTION AND AIRWORTHINESS CERTIFICATION APPROVAL REQUIREMENTS

Instructor: Jim Reeves

Day One

- Review course content and identification of attendee key issues
- Aircraft certification service versus flight standards
- Overview of 14 CFR Part 21
- Designee and delegations
- Rules, policy and guidance
- FAA conformity process

Day Two

- Production approvals
- Quality system requirements
- Aircraft Certification Systems Evaluation Program (ACSEP)
- Certificate management
- Airworthiness approvals

Day Three

- Airworthiness approvals
- Compliance and enforcement
- Organizational Delegation Authorization (ODA)

A participant can expect to

- learn the FAA quality assurance system requirements for producing parts for the civil aviation fleet;
- obtain a clear understanding of the FAA conformity inspection process;
- understand the requirements and process leading up to an FAA production approval;
- gain an understanding of what the FAA considers the elements of a good quality assurance system and how the FAA audits the system;
- learn the various FAA airworthiness approvals and how they apply to your product;
- learn what it takes to export your products to other countries;
- understand the FAA's compliance and enforcement program.

Available as on-site course

Contact us for a no-cost, no obligation proposal for an on-site course:

Zach Gredlics

On-site Program Manager

E-mail aerosite@ku.edu

Phone 785-864-1066

Times/CEUs

Class time 21 hours

CEUs 2.1

Description

Presents the fundamental FAA requirements to produce products, appliances and parts for installation on FAA-type certificated products. Includes FAA conformity process, quality assurance requirements, the FAA's evaluation program, airworthiness requirements and certificate management. Also includes a broad overview of the Organizational Delegation Authorization (ODA) regulations, qualification, responsibilities, application, appointment, operation and management.

Target Audience

Designed for government and industry (original equipment and suppliers) engineers, quality assurance personnel, Designated Airworthiness Representatives (DARs) and managers involved in the manufacture of products, appliances and parts installed on civil or military aircraft with FAA airworthiness certification.

Fee

Includes instruction and a course notebook. The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Aerospace Compliance Track. See page 6.

FAA FUNCTIONS AND REQUIREMENTS LEADING TO AIRWORTHINESS APPROVAL

Instructors: Gilbert L. Thompson and Robert D. Adamson

The course may be taught by either instructor, based on his availability.

Location

Location Seattle, Washington

Date April 24–26, 2012

Course Number AA121420

Times/CEUs

Tuesday–Thursday 8 a.m.–4 p.m.

Class time 21 hours

CEUs 2.1

Description

Overview of the FAA organizational structure and its function in aircraft certification, the rule-making and advisory process, production rules applicable to aircraft and aircraft components, subsequent certification process and continued airworthiness. Course is specifically tailored toward civil airworthiness certification. Course is FAA-approved for IA renewal.

Target Audience

Designed for industry (airframe and vendor) engineers, design engineers, civil airworthiness engineers, consultants, project directors, aircraft modifiers, FAA Designated Engineering Representatives (DERs) and coordinators, FAA organizational designees/authorized representatives (ARs), industry and governmental quality assurance inspectors and managers.

Fee

\$1,795

Includes instruction, a course notebook, CD, refreshments and three lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Aerospace Compliance Track. See page 6.

Day One

- Review of course content and identification of attendee key issues
- Overview of FAA Aircraft Certification (AIR) and Flight Standards (AFS) service organization and functions
- Advisory Circular, Notice and Order process and issuance
- Federal Aviation Regulations (FAR) Parts 1 and 11
- FAR Part 21 and the Technical Standard Order Authorization (TSOA) process

Day Two

- Parts 43 and 45
- Part 36 Noise Requirements
- Part 39 Airworthiness Directives
- Part 183 Representatives of the Administrator, including Subpart D, Organization Designation Authorization (ODA); Flight Standards Aircraft Evaluation Group's (AEG) role in aircraft certification
- Parts 23, 25, 26, 27, 29 and 33
- Rulemaking and special conditions, process and issuance
- Equivalent level of safety and exemption process
- Parts Manufacturer Approval (PMA)
- Type Certification (TC) and Supplemental Type Certification (STC) process (FAA Handbook 8110.4)

- Certification Process Improvement (CPI), FAA and Industry Guide to Product Certification, Partnership for Safety Plan (PSP)/Project Specific Certification Plan (PSCP)
- Documentation of typical TC/STC projects
- Safety Management concepts
- FAA Form 337/Field Approval

Day Three

- Continuation of typical TC and STC projects
- Relation of Parts 23 and 25 to Civil Aviation Regulations (CAR), CARs 3 and 4b
- Developing Type Certification Data Sheets (TCDS)
- Noise Certification Part 36; Airworthiness Directive (AD) process, Part 39
- AEG's involvement in MMEL, maintenance and flight manuals
- Flight Standards Information Management System (FSIMS), notices and orders related to airworthiness
- Bilateral Aviation Safety Agreements (BASA)
- U.S./European Union Executive Agreement and the European Aviation Safety Agency (EASA)
- International Civil Aviation Organization (ICAO)

FLIGHT CONTROL ACTUATOR ANALYSIS AND DESIGN

Instructor: Donald T. Ward

Day One

- Introduction
- Overview of aircraft flight control surfaces, components and functions: primary flight control, secondary flight control; trim and feel, power control units
- Advanced actuation concepts
- Mechanically controlled actuation schemes: modeling and simulation basics
- Electrically signaled (Fly-By-Wire or FBW) systems

Day Two

- Electrically signaled (FBW) systems (continued)
- Modeling and simulation of FBW examples
- Alternate command systems
- Electrically powered actuation (Power-By-Wire or PBW) systems

Day Three

- Electrically powered actuation (Power-By-Wire or PBW) systems (continued)
- Modeling and simulation of PBW examples
- Flight control system design requirements
- Specifications and documents: Power Control Unit (PCU) and Power-Drive Unit (PDU) analysis and design

Day Four

- PCU and PDU analysis and design (continued)
- Dynamic performance and response

Day Five

- Dynamic analysis and modeling exercise
- PCU assembly and installation
- Quality assurance

Available as on-site course

Contact us for a no-cost, no obligation proposal for an on-site course:

Zach Gredlics
On-site Program Manager
E-mail aerosite@ku.edu
Phone 785-864-1066

Times/CEUs

Class time 31.5 hours

CEUs 3.15

Description

Provides an in-depth understanding of actuators, sensors and other components of flight control systems. Includes both analysis and practical use of flight control system components. Reviews good design practices typically used in flight control system design.

Target Audience

Designed for recent graduates of engineering or for practicing engineers outside the aerospace industry who need practical exposure to the types of actuation hardware, sensors and design practices used on both commercial and military aircraft. Students should be acquainted with control design software. (MATLAB/Simulink or Scilab are currently utilized in the course for example problems.)

Fee

Course includes instruction, a course notebook, CD and *R-123 Aircraft Flight Control Actuation System Design* by Eugene Raymond and Curt Chenoweth.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Flight Control Systems Design Track. See page 6.

A participant can expect to learn

- perspective on how flight control systems have evolved in modern aircraft;
- alternative types of flight control systems and possible component elements;
- basic use of analysis tools in flight control design;
- introduction to flight control systems requirements.

FLIGHT CONTROL AND HYDRAULIC SYSTEMS

Instructor: Wayne Stout

Location

Location Seattle, Washington

Date April 23–27, 2012

Course Number AA121390

Location Orlando, Florida

Date November 5–9, 2012

Course Number AA131200

Times/CEUs

Monday–Thursday 8 a.m.–4 p.m.

Friday 8 a.m.–11:30 a.m.

Class time 31.5 hours

CEUs 3.15

Description

Covers fundamental design issues, system requirements and analysis design methodologies for aerospace hydraulic and flight control systems. Includes design requirements, component description and operation, component and system math modeling, component sizing, system layout rationale, system sizing and airframe integration. Emphasizes the fundamentals and necessary engineering tools (both analytical and otherwise) needed to understand and design aerospace hydraulic and flight control systems. Practical examples and actual systems are presented and discussed throughout the class.

Target Audience

Designed for system and component level engineers and managers, including airframe, vendor, industry, government and educators involved with aerospace mechanical systems.

Fee

\$2,395

Includes instruction, a course notebook, refreshments and five lunches.

The course notes are for participants only and are not for sale.

Attendees should bring a pocket calculator.

Certificate Track

This course is part of the Flight Control Systems Design Track. See page 6.

Day One

- Introduction and background, system design methodology, design requirements (customer, business, regulatory, engineering, environmental, competition), design implications of requirements, design requirement example, design guides and manuals, testing
- Hydraulic fundamentals: fluid properties (density, viscosity, bulk modulus), fluid flow (tubes, orifices, servo), pressure transients in fluid flow, conservation of mass and momentum, basic hydraulic system modeling equations, computer aided modeling of hydraulic systems, examples

Day Two

- Hydraulic components: operation, examples, fundamental equations for each component and component sizing, components include actuators, metering valves, relief valves, shuttle valves, pumps, motors, check valves and fuses, accumulators, reservoirs, pressure regulation and flow control, thermodynamics of hydraulic systems, examples

Day Three

- Servovalves (flapper, jet pipe and motor controlled)
- Hydraulic system design: basic system configurations, power generation systems, landing gear control, brake systems, flaps/slats, spoilers, steering, thrust reversers, primary flight control, actuation examples (mechanical and electrical)
- Hydraulic system design issues, impact of certification regulations, hydraulic system design methodology, failure modes, safety analysis issues and redundancy, integration with mechanical systems

Day Four

- Mechanism fundamentals: mechanical advantage, gearing ratios, building block mechanisms (linkages, bellcranks, overcenter, dwell or lost motion, addition/amplification, yokes, cables, override and disconnects, etc.), four bar linkages, gearing fundamentals, gearing systems including standard/planetary gear trains, power screws, nonlinearities, stiffness, examples of mechanical systems
- Flight control system design: flight control configurations (reversible, irreversible, fly-by-wire), mechanization of flap/slats, flight control system design issues, impact of certification regulations, flight control system design methodology and examples

Day Five

- Flight control system airframe integration, hydraulic system integration, fault detection, fly-by-wire actuation
- Flight control system failure modes (jams, runaways, slow overs), safety analysis issues and redundancy

FLIGHT TEST PRINCIPLES AND PRACTICES

Instructors: Donald T. Ward, George Cusimano



Day One

- Flight test overview and introduction
- The atmosphere: properties, altimetry, pneumatic lag; air data principles and measurements: airspeed, altitude, Mach number, alpha and beta
- Mass, center of gravity and moment of inertia determination
- Time/space position measurements

Day Two

- Air data calibration methods: position error
- Temperature probe, angle of attack and sideslip calibration
- Instrumentation system principles: design requirements, static and dynamic response, calibration
- Data recording and processing methods: analog, digital, filtering and signal conditioning
- Proper use of digital bus data (MIL-1553, ARINC 429, 629) for flight testing; propulsion system testing: piston, turboprop and turbofan engines
- In-flight measurement of thrust and power

Day Three

- Stall tests: stall speed determination, stall characteristics, stall protections systems
- Flight test program planning: organization, milestones, flight cards, documentation, procedures, safety issues

- Takeoff and landings and cruise performance: speed, range and endurance
- Climb performance: test methods, correction to standard conditions, specific energy concepts

Day Four

- Advanced performance methods: nonstabilized performance methods, turning performance, ground effect measurement, getting more for less from flight tests
- Static stability and control: longitudinal and lateral-directional static stability testing
- Dynamic stability and control: dynamic mode characteristics and measurement
- Handling qualities: Cooper-Harper scale, FAR and MIL-SPEC requirements, workload scale
- Parameter identification: regression analysis, maximum likelihood estimation of derivatives

Day Five

- Thrust drag accounting, isolation and measurement of component drags
- Structural flight tests: static loads, flutter
- Flow visualization: tufts, flow cones, sublimating chemicals, liquid crystals, dyes, smoke injection; test methods
- Spin testing: test methods, safety issues
- Systems testing and evaluation: communication, navigation, SAS and autopilots

Location

Location Seattle, Washington

Date April 23–27, 2012

Course Number AA121400

Location Southern Maryland Higher Education Center
California, Maryland

Date October 15–19, 2012

Course Number AA131500

Times/CEUs

Monday–Friday 8 a.m.–4 p.m.

Class time 35 hours

CEUs 3.5

Description

Introduction to and definition of the basic flight test process, application of engineering principles to flight test and description of common flight test practices: a survey of the flight test discipline embellished with a variety of examples from completed flight test programs.

Target Audience

Designed for all levels of engineers and managers in industry working on flight test projects, military and civil project engineers, test pilots and flight test engineers, government research laboratory personnel and FAA and other regulatory agency engineers.

Fee

Seattle

\$2,395

SMHEC

\$1,895 with U.S. military ID

\$2,195 non-military

Includes instruction, a course notebook, *Introduction to Flight Test Engineering, Volume I*, by Donald T. Ward, Thomas W. Strganac and Rob Niewoehner and five lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Flight Tests and Aircraft Performance Track. See page 6.

FLIGHT TESTING UNMANNED AIRCRAFT—UNIQUE CHALLENGES (NEW)

Instructor: George Cusimano

Location

Location Orlando, Florida

Date November 6–8, 2012

Course Number AA131230

Times/CEUs

Tuesday–Thursday 8 a.m.–4 p.m.

Class time 21 hours

CEUs 2.1

Description

Flight testing unmanned aircraft systems (UAS) presents unique challenges seldom seen in manned flight test programs. The sources of most of these challenges result from the Development Test and Evaluation (DT&E) of the unmanned test vehicles. This course introduces the methods and challenges associated with flight testing both remotely piloted and command directed (a.k.a. autonomous) vehicles. The course discusses UAV design and employment principles in order to help the student understand how UAVs are flight tested and why.

Target Audience

The course is designed for practicing flight test engineers, test pilots, test managers, aircraft engineers, aircraft designers and educators who already possess a fundamental understanding of flight test principles and practices. The course content is appropriate for civilian, military and academic researchers.

Fee

\$1,795

Includes instruction, a course notebook, refreshments and three lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Flight Tests and Aircraft Performance Track. See page 6.

Day One

- Introduction and history
- Fundamentals of flight test
- Typical user requirements
- Typical UAS architecture
- The role of modeling and simulation in flight testing UAVs
- UAV design characteristics
- Flight test mission planning considerations

Day Two

- Fundamentals of performance flight test
- Fundamentals of stability and control flight test
- Parameter identification methods
- Risk management

Day Three

- Human factors considerations
- UAV flight test challenges including:
 - Testing without a pilot
 - Getting off the ground
 - Envelope expansion
 - Testing contingencies
 - See and avoid
- Lessons learned in UAV flight testing
- Summary and wrap-up

The course includes case studies and classroom exercises to help reinforce several of the important concepts developed during the academic portion of the classes.

FUNDAMENTAL AVIONICS

Instructors: Albert Helfrick, Brian Butka, William Barott, Robert Chupka

The course may be taught by one instructor or a combination of instructors, based on their availability.

Day One

- Early history of aviation and wireless
- History of regulatory and advisory bodies
- Establishment of the National Airspace System, NAS
- Federal Aviation Regulations, FAR
- European regulatory and advisory agencies
- Radio navigation
- Antennas and radio beams
- Nondirectional beacon
- VHF Omni range
- Distance measuring, DME

Day Two

- Long-Range Navigation, LORAN
- Landing Systems, ILS
- Radar altimeter
- Ground proximity warning systems
- Terrain Awareness and Warning System. TAWS
- Satellite navigation
- Global positioning system, GPS

Day Three

- Secondary radar, Mode A/C, Mode S
- Collision avoidance, TCAS
- Automatic Dependent Surveillance, Broadcast, ADSB
- Weather radar
- Lightning detection
- Airborne communication

- Aeronautical telecommunications network
- Data buses/networking
- Compass/gyros
- Air data systems

Day Four

- Inertial navigation
- Laser gyros
- Random Navigation, RNAV
- Required Navigation Performance, RNP Displays
- Human factors
- Electromagnetic compatibility
- High intensity radiated fields, HIRF
- Lightning effects

Day Five

- Airborne environment, DO-160
- Failure analysis
- Safety assessment
- Design assurance levels
- Reliability prediction, MIL-HDBK 217
- Software considerations, DO-178
- Hardware considerations, DO-254
- Flight data recorder
- Cockpit voice recorder
- Reliability and safety analysis

Location

Location Seattle, Washington

Date April 23–27, 2012

Course Number AA121410

Location San Diego, California

Date September 17–21, 2012

Course Number AA131100

Times/CEUs

Monday–Thursday 8 a.m.–4 p.m.

Friday 8 a.m.–2:45 p.m.

Class time 33.75 hours

CEUs 3.375

Description

This course is a comprehensive study of avionics from the simple stand-alone systems to the latest integrated systems. The theory of operation is covered as well as the environment and certification processes.

Target Audience

Designed for avionics engineers, electronic testing laboratory personnel, airframe systems and flight test engineers, government research laboratory personnel, FAA DERs and military personnel procuring civil equipment.

Fee

\$2,395

Includes instruction, course notebook, *Principles of Avionics*, by Albert Helfrick, supplemental materials, refreshments and five lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Avionics and Avionic Components Track. See page 6.

“Avionics: Great course. Amazing Instructor. Overall great experience.”

— 2011 Fort Worth Attendee

FUNDAMENTALS OF ROTORCRAFT VIBRATION

Instructor: Richard L. Bielawa

Location

Location Dallas/Fort Worth, Texas

Date March 5–9, 2012

Course Number AA121320

Times/CEUs

Monday–Thursday 8 a.m.–4 p.m.

Friday 8 a.m.–11:30 a.m.

Class time 31.5 hours

CEUs 3.15

Description

Material is presented for acquiring familiarity with both the underlying physics and the basic analytical tools needed for addressing rotorcraft vibration phenomena. Topics include a review of appropriate mathematical techniques, gyroscopic theory, blade natural frequency characteristics, drive system dynamics, vibration alleviation devices, rotorcraft instability phenomena and testing procedures. While some new analysis techniques are introduced, the course will address familiarization with the physics using traditional methodology.

Target Audience

Designed for those engineers, engineering managers and educators involved in rotorcraft research, design, development and/or testing who seek a basic familiarity with the range of rotorcraft vibration issues that must be addressed in contemporary rotorcraft.

Fee

\$2,395

Includes instruction, a course notebook, CD, *Rotary Wing Structural Dynamics and Aeroelasticity, Second Edition*, by Richard L. Bielawa, refreshments and five lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Flight Tests and Aircraft Performance Track. See page 6.

Day One

- Introduction: overview of rotorcraft structural dynamic problems and solutions
- Mathematical tools: linear systems, Fourier analysis, damping, multiple-degree-of-freedom systems, natural modes, resonance, stability
- Rotational dynamics and gyroscopics: simplified gyroscope equation, precessional characteristics of rotors
- Dynamics of rotating slender beams: hinged rigid blades, effects of elastic restraints about the hinges, the Euler beam and basic DEQ for transverse bending, Yntema charts and numerical methods for bending modes, the two-bladed rotor, torsional dynamics, coupling issues, experimental verification and tracking and balancing, blade section properties, the SECT_PRT computer code, blade natural frequencies, the BLAD_FREQ computer code
- Problem session

Day Two

- Transverse vibration characteristics: the Jeffcott rotor model, subcritical and supercritical operation, pseudo-gyroscopic effects, whirl speeds and modes and rotor instabilities
- Basic balancing techniques
- Torsional natural frequencies of shafting systems: element equivalences, basic natural frequency calculations, branched gear systems, drive system for a typical rotorcraft, drive system natural frequencies, the TORS_HDS computer code, problem session
- Problem session
- Fuselage vibrations basic issues: forced response and vibrations, the rotor as an excitation source and filter, rotor-fuselage interaction, 1P vibrations, the two-bladed rotor
- Full-scale vibration testing of real systems: suspension and excitation techniques, instrumentation, typical shake-test results for helicopters, operational modal analysis

Day Three

- Fuselage vibrations (continued): modal identification, techniques for achieving response modification, antiresonance theory, methods for vibration alleviation, elastomeric devices, vibration testing applied to material characterization
- Linear stability analysis methods: constant coefficient systems, force phasing matrices, Floquet theory, frequency-domain methods
- Blade aeromechanical instabilities: air mass dynamics, quasi-steady aerodynamics, pitch-flap-lag and flap-lag instabilities
- Software for blade aeromechanical stability analysis
- Problem session

Day Four

- Linear unsteady aerodynamics: general frequency domain theories, finite state formulations
- Bending-torsion flutter: basic flutter theory, bending-torsion of rotor blades, general analysis methods
- Nonlinear aeroelastic stability analyses: nonlinear unsteady aerodynamics, stall flutter, BOOT and SHOT
- Rotor-fuselage coupled instabilities: propeller-nacelle whirl flutter, ground resonance, air resonance
- Software for ground and air resonance calculations
- Problem session

Day Five

- Testing for dynamics at model and full scales: model scaling law, instrumentation and test procedures, methods for instability quenching
- Methods for quantifying stability
- Special topics: aeroelastic optimization, composite blade design, drive system compatibility with engine/fuel control systems-analysis techniques, stabilization
- Summary and future trends

HELICOPTER PERFORMANCE, STABILITY AND CONTROL

Instructor: Ray Prouty



Day One

- The hovering helicopter
- Factors affecting hover
- Vertical flight
- Momentum theory of forward flight
- Blade-element theory of forward flight

Day Two

- Blade-element theory of forward flight (continued)
- Forward flight computer program
- Estimating performance
- Calculating performance characteristics
- Maneuvering flight

Day Three

- Rotor flapping characteristics
- Trim and static stability
- Dynamic stability
- Aerodynamic considerations of main rotor

Day Four

- Airfoils for rotor blades
- Anti-torque systems
- Empennages and wings
- Other configurations: tandems, coaxials, synchropters, tilt-rotors, tilt-wings
- The preliminary design process

Day Five

- Noise
- Vibrations
- Helicopter accidents

“Excellent overview from tip to tail as well as history of the business provides a unique opportunity to propel my company into a stronger future.”

— On-site participant

Location

Location Southern Maryland Higher Education Center
California, Maryland

Date June 4–8, 2012

Course Number AA121630

Location San Diego, California

Date September 17–21, 2012

Course Number AA131110

Times/CEUs

Monday–Thursday 8 a.m.–4 p.m.

Friday 8 a.m.–11:30 a.m.

Class time 31.5 hours

CEUs 3.15

Description

What the working helicopter aerodynamicist needs to know to analyze an existing design or participate in the development of a new one. Covers all aspects of hover, vertical flight and forward flight. Emphasis on relating helicopter aerodynamics to airplane aerodynamics for those who are making the transition.

Target Audience

Designed for engineers, engineering managers and educators who are involved in helicopters.

Fee

California, Maryland

\$1,895 with U.S. military ID

\$2,195 non-military

San Diego, California

\$2,395

Includes instruction, a course notebook and five lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Aircraft Design Track. See page 6.

INTEGRATED MODULAR AVIONICS AND DO-297

Instructor: Leanna K. Rierson

Location

Location San Diego, California

Date September 20–21, 2012

Course Number AA131160

Times/CEUs

Thursday–Friday 8 a.m.–4 p.m.

Class time 14 hours

CEUs 1.4

Description

This course provides the fundamentals for developing and integrating IMA systems, using TSO-C153 (Integrated Modular Avionics Hardware Elements), FAA Advisory Circular 20-145 (Guidance for Integrated Modular Avionics (IMA) that Implement TSO-C153 Authorized Hardware Elements) and DO-297 (Integrated Modular Avionics (IMA) Development Guidance and Certification Considerations). Practical exercises and in-class activities will be used to enhance the learning process.

Target Audience

Designed for developers and integrators of integrated modular avionics systems. The focus will be on identifying challenges with IMA and satisfying the regulatory guidance.

Fee

\$1,375

Includes instruction, course notebook, *RTCA/DO-297 Integrated Modular Avionics (IMA) Development Guidance and Certification Considerations*, refreshments and two lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Avionics and Avionic Components Track. See page 6.

Day One

- Introductions and background
- What is IMA?
- What are the benefits of IMA?
- History of IMA and supporting certification guidance
- Overview of the IMA guidance material
- TSO-C153 (Integrated Modular Avionics Hardware Elements)
- Purpose of TSO-C153
- Limitations of TSO-C153
- Experiences to date with TSO-C153
- TSO-C153 contents
- Developing a minimum performance specification per TSO-C153
- Unique aspects of TSO-C153
- FAA Advisory Circular 20-145 (Guidance for Integrated Modular Avionics (IMA) that Implement TSO-C153 Authorized Hardware Elements)
- Purpose of the Advisory Circular (AC)
- Technical highlights from the AC
- Roles and responsibilities
- Considering TSO-C153 and AC 20-145 from various user perspectives (e.g., avionics developer and aircraft manufacturer)
- DO-297 (Integrated Modular Avionics (IMA) Development Guidance and Certification Considerations)
- Overview of DO-297

Day Two

- DO-297 (continued)
- Technical highlights of DO-297
- Design guidelines
- Partitioning analysis
- Health management
- Integration
- Configuration files and configuration management
- Certification approach of DO-297
- Six certification tasks
- Life cycle processes
- Life cycle data
- FAA's plans for recognizing DO-297
- ARINC 653 Usage in IMA Systems
- Using TSO-C153, AC 20-145, DO-297 and ARINC 653 together
- Common challenges in IMA development and certification
- Practical tips for IMA development and certification

Enroll in this course and Complex Electronic Hardware Development and DO-254. (See page 30)

Save money! The cost for the two courses combined is \$2,395.

A participant can expect to

- gain valuable insight into the IMA development and certification processes;
- understand the importance of IMA design assurance;
- obtain practical insight into how to address some of the common IMA challenges;
- understand FAA's IMA policy and guidance.

“This course gives an excellent overview and understanding of the entire IMA process and you could not ask for a better instructor. I will use this information as a regulator.”

— Bryan Easterwood, MAA MCO

MODELLING AND ANALYSIS OF DYNAMICAL SYSTEMS USING MATLAB

Instructor: Walt Silva

Day One

- Introduction and motivation
- Brief review of mathematical concepts
- Mathematical classification of systems
- Linear vs. nonlinear
- Time invariant vs. time varying
- Memory vs. memoryless
- Deterministic vs. stochastic
- Examples
- Linear systems
- Continuous-time systems
- Definitions
- Convolution
- Transform techniques (s-plane)
- Discrete-time systems
- Definitions—discretization
- Convolution
- Transform techniques (z-plane)

Day Two

- Linear systems (cont'd)
- Influence coefficients, Green's functions and ODEs
- Orthogonality and basis functions
- Digital Signal Processing (DSP)
- State-space models
- System identification

- Nonlinear systems (time domain)
- Definitions
- Equilibrium points
- Limit Cycle Oscillations (LCO)
- Bifurcations and chaos
- Example: logistic equation
- Nonlinear state-space models
- Linearization
- Nonlinear systems (frequency domain)
- Power Spectrum Density (PSD)
- Linear vs. nonlinear frequency dynamics
- Various examples

Day Three

- MATLAB
- Basic commands
- Continuous-time state-space models
- Discrete-time state-space models
- Frequency analysis
- System identification examples
- Simulink
- Block Library
- Sources and sinks
- Models and systems
- Simulations
- Open forum and discussion

A participant can expect to learn

- the difference between a linear and a nonlinear system;
- the implications of time invariance and time varying;
- the interpretation of physical and mathematical system responses;
- the application of time and frequency-domain methods for improved understanding;
- how to model and analyze a broad range of systems using MATLAB.

Available as on-site course

Contact us for a no-cost, no obligation proposal for an on-site course:

Zach Gredlics

On-site Program Manager

E-mail aerosite@ku.edu

Phone 785-864-1066

Times/CEUs

Class time 21 hours

CEUs 2.1

Description

This course covers a broad range of practical methods that will enable the participant to accurately model and analyze real-world dynamical systems using MATLAB. Topics covered include the mathematical classification of systems, continuous- and discrete-time systems; transform methods, digital signal processing, state-space modeling and the use of MATLAB and Simulink to develop these models.

Target Audience

The intended audience includes scientists, engineers, mathematicians and anyone with a need to develop and understand mathematical models of real-world dynamical systems.

Fee

Includes instruction and course notebook.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Flight Control Systems Design Track. See page 6.

OPERATIONAL AIRCRAFT PERFORMANCE AND FLIGHT TEST PRACTICES

Instructor: Mario Asselin

Location

Location San Diego, California

Date September 17–21, 2012

Course Number AA131120

Times/CEUs

Monday–Friday 8 a.m.–4 p.m.

Class time 35 hours

CEUs 3.5

Description

Overview of airplane performance theory and prediction, certification standards and basic flight test practices. Course will focus on turbojet/turbofan-powered aircraft certified under JAR/CAR/14 CFR Part 25. This standard will briefly be compared to military and Part 23 standards to show different approaches to safety, certification, operational and design differences.

Target Audience

Designed for aeronautical engineers in the design or flight test departments, educators, aircrews with engineering background and military personnel involved in managing fleets of 14 CFR Part 25 (FAR 25)-certified aircraft.

Fee

\$2,395

Includes instruction, a course notebook, *An Introduction to Aircraft Performance*, by Mario Asselin, refreshments and five lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Flight Tests and Aircraft Performance Track. See page 6.

Day One

- Introduction
- Atmospheric models
- Airspeeds
- Position errors
- Drag polar and engine models
- Weight and balance

Day Two

- Stall speeds and stall testing
- Stall warning and stall identification
- Required instrumentation and data reduction
- Testing for low-speed drag, excess thrust monitoring
- Check climbs
- High-speed drag and basic flight envelope limits

Day Three

- Aircraft range
- Measuring SAR
- Data reduction
- Presenting the information to aircrews
- Climbing performance
- WAT limits; turning performance

Day Four

- Take-off performance, basic models
- Flight test
- Rejected takeoff
- Presenting the information to the flight crew (AFM, flight manuals)

Day Five

- Landing performance
- Presenting the information to the flight crew (AFM, flight manuals)
- Consideration for contaminated runways (CAR/JAR)
- Obstacle clearance
- Accounting for high temperature deviation for minimum altitude flights

A participant can expect to

- review basic airplane performance theory;
- determine what needs to be tested to build performance models;
- determine the required instrumentation to best measure airplane performance;
- understand the scatter normally expected during flight testing and how appropriate feedback from engineering helps the flight crew minimize this scatter;
- develop performance models to match flight test results;
- understand the safety level built-in certification requirements and their impact on airplane performance;
- understand how to show compliance to the certification authorities;
- learn how to present the airplane performance information to the flight crew;
- understand how to set operational limits to ensure continued operational safety.

PRINCIPLES OF AEROELASTICITY

Instructor: Thomas William Strganac

Day One

- Overview and foundation
- Introduction and historical review
- Fundamentals: definitions, similarity parameters and aeroelastic stability boundaries
- Static aeroelasticity: divergence, lift effectiveness, control effectiveness, reversal and active suppression
- Introduction to dynamic aeroelasticity: gust response, flutter, buzz

Day Two

- Theory
- Principles of mechanical vibrations
- Modal methods
- Structural dynamics
- Steady and quasi-steady aerodynamics

Day Three

- Theory (continued)
- Unsteady aerodynamics: “Theodorsen” aerodynamics, numerical methods and approximations, strip theory, vortex and doublet lattice methods
- Methods of analysis
- Governing equations for the aeroelastic system

- Frequency domain methods: modal formulations, V-g diagrams, K-method (U.S. method) and P-k method (British method)
- Time domain methods

Day Four

- Flutter identification
- Review of flutter models
- The flutter boundary: civilian and military requirements, matched point flutter analysis
- Case studies: examples of flutter analysis
- Experiments: ground vibration tests, wind tunnel tests

Day Five

- Practice
- Aeroservoelasticity for flutter suppression
- Aeroelastic tailoring
- Wind tunnel tests
- Flight tests
- Nonlinear aeroelasticity: limit cycle oscillations, store-induced instabilities
- Concluding remarks

Location

Location Dallas/Fort Worth, Texas

Date March 5–9, 2012

Course Number AA121330

Times/CEUs

Monday–Thursday 8 a.m.–4 p.m.

Friday 8 a.m.–2 p.m.

Class time 33 hours

CEUs 3.3

Description

Provides an in-depth understanding of aeroelastic behavior for aerospace systems. Explores aeroelastic phenomena, structural dynamics and fluid-structure-control interaction; also examines practical issues such as ground and flight tests. Includes solution methodologies, state-of-the-art computational methods for aeroelastic analysis, development of the operational boundary, aeroservoelasticity and contemporary issues such as limit cycle oscillations and related nonlinear pathologies in aeroelastic systems.

Target Audience

Designed for engineers and technical managers involved in aerospace vehicle design, analysis and testing.

Fee

\$2,395

Includes instruction, a course notebook, *Aeroelasticity*, by Raymond Bisplinghoff, Holt Ashley and Robert Halfman, *Introduction to Flight Test Engineering, Volume II*, by Donald T. Ward, Thomas William Strganac and Robert Niewoehner, refreshments and five lunches.

Certificate Track

This course is part of the Flight Tests and Aircraft Performance Track and Aircraft Design Track. See page 6.

A participant can expect to learn

- the working terminology, nomenclature and definitions related to static and dynamic aeroelasticity;
- the response and stability characteristics of the aerospace system that arise from the interaction of aerodynamic, structural dynamic and inertial loads;
- the physics of aeroelasticity through a review of simple paradigms of the aeroelastic system;
- the relationship between ground tests and flight tests;
- the relationship between analysis from math tools and the vehicle operating boundary.

PRINCIPLES OF AEROSPACE ENGINEERING

Instructor: Wally Johnson

Location

Location San Diego, California

Date September 10–14, 2012

Course Number AA131060

Times/CEUs

Monday–Thursday 8 a.m.–4 p.m.

Friday 8 a.m.–11:30 a.m.

Class time 31.5 hours

CEUs 3.15

Description

The objective of this course is to provide an overview and integrated exposure to airplane aerodynamics, performance, propulsion, flight mechanics, mass properties, structural dynamics, aeroelasticity, structural loads, structures, aerodynamics and performance of helicopters, ground testing, flight testing and certification. The material presented in this course is in the form of lecture notes and showing examples of the Basic Aerospace Engineering software. This course shows the relationship between aircraft certification requirements, engineering analysis and testing.

Target Audience

This course is intended as an overview for non-aerospace engineering-degreed professionals, managers, military and government personnel who are involved in aircraft design and certification.

Fee

\$2,395

Includes instruction, a course notebook, a copy of Basic Aerospace Engineering software, refreshments and five lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Aircraft Design Track. See page 6.

Day One

- Introduction
- Atmospheric models and airspeed measurements
- Introduction to certification requirements
- Introduction to aerodynamics—review of basic aerodynamic concepts: airfoil fundamentals, finite wings, aircraft aerodynamics. Overview of wind tunnel testing, overview of computational fluid dynamics methods
- Introduction to propulsion—types of propulsion systems, thrust calculations

Day Two

- Airplane performance—review basic airplane performance theory; airspeeds, takeoff, landing and cruise performance; climb performance; turning performance, range and endurance
- Weight and balance—calculation of mass properties: weight, center of gravity and moment of inertia; establishing the weight-cg envelope
- Flight mechanics—aircraft axis systems, aircraft equations of motion, static and lateral-directional stability, longitudinal and lateral-directional applied forces and moments. Linearizing the equations of motion; aircraft dynamic stability
- Flight maneuvers—steady maneuvers, pull-up, pitch maneuvers, yaw maneuvers, roll maneuvers

Day Three

- Mechanics of materials—material behavior under loading, stress-strain relations, beam bending and buckling, yield, compressive, tensile and fatigue strengths
- Mechanical vibrations and structural dynamics
- Aeroelasticity—static aeroelasticity: divergence, control effectiveness, reversal; dynamic aeroelasticity: gust response, flutter and buffet

Day Four

- Introduction to helicopter— aerodynamics of flight, basic flight maneuvers
- Structural loads—external loads classifications; V-n diagram; gust loads, landing loads, ground loads, fatigue loads, wing loads, horizontal tail loads, vertical tail loads, fuselage loads and control surface loads
- Aircraft structures—structural design concept, static strength design, factor of safety, material selection, introduction to the finite element method, damage tolerance design

Day Five

- Ground testing: instrumentations, bird strike, landing gear drop test, ground vibration, ground loads calibration, static loads tests and fatigue loads tests
- Flight testing: stall speeds, longitudinal stability and control, directional stability and control, flutter, flight loads validation, operational loads monitoring
- Airplane crashes—what went wrong and why

“The course content and materials are superb and fit to just what I need. The instructor is superb, engaging and knowledgeable. He provides a very good foundation for future classes.”

— Davie L. Wade – Computational Fluid Dynamics Engineer
General Atomics Aeronautical Systems, Inc.

PROCESS-BASED MANAGEMENT IN AEROSPACE: DEFINING, IMPROVING AND SUSTAINING PROCESSES

Instructor: Michael Wallace

Day One

- Introduction
- Overview of aerospace organizational processes
- Needs for continuous improvement
- Back to basics
- Basic principles
- Data gathering methods
- Decomposing processes
- Setting performance goals
- Process ownership
- Critical success factors
- Process mapping

Day Two

- Process measurement
- Defining process measures
- Process measures at the organizational level (balanced scorecard)
- Identifying and controlling variation
- Diagnostic tools
- Basic Six Sigma tools
- Benchmarking
- Change management
- Risk management

Day Three

- Cultural focus
- Integration of strategy and process management

- Role of the leadership team
- Team based decision-making methods
- Self-directed work teams
- High-performance work teams
- Organizational relationships
- Facilitation skills

Day Four

- Identifying and capitalizing on process improvement opportunities
- Conducting a self-assessment
- Systemic approach to product development
- Enterprise process model
- The economics of quality
- Quality management system
- Pitfalls and how to avoid them
- Case studies

Day Five

- Case studies (continued)
- Advance process management techniques and tools
- Performance improvement system
- Knowledge management
- Process modeling
- Knowledge-based engineering
- Artificial intelligence
- Summary and wrap-up

Location

Location Dallas/Fort Worth, Texas

Date March 5–9, 2012

Course Number AA121340

Times/CEUs

Monday–Friday 8 a.m.–4 p.m.

Class time 35 hours

CEUs 3.5

Description

Provides basic principles and the tools and techniques of Process Based Management (PBM) and delineates the strategies for successful implementation of PBM in an aerospace organization. Focuses on how to depict an enterprise process view, develop process measures, define key components and identify critical success factors to maintain the focus on priority requirements for managing processes to achieve sustainable performance improvements. Several aerospace organizational case studies are used to augment the theoretical components.

Target Audience

Managers, engineers, quality, IT and planning professionals in aerospace industry responsible for the identification, implementation and improvement of existing organizational processes and development of new processes necessary to compete in the future.

Fee

\$2,395

Includes instruction, a course notebook, refreshments and five lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Management and Systems Track. See page 6.

A participant can expect to learn

- existing processes and develop metrics to determine if your organization is achieving desired output;
- to benchmark other organizations' processes to determine improvements for your organization processes;
- to use technology to improve your organization processes and quality;
- how to get lean and implement a lean culture from design to delivery.

PROJECT MANAGEMENT FOR AEROSPACE PROFESSIONALS

Instructor: Herbert Tuttle

Location

Location Orlando, Florida

Date November 5–9, 2012

Course Number AA131210

Times/CEUs

Monday–Friday 8 a.m.–4 p.m.

Class time 35 hours

CEUs 3.5

Description

Designed to give aerospace professionals familiarity with current project management techniques. Includes identifying the functions of a project team and management team; the integration of project management; work breakdown structures, interfaces, communications and transfers; estimating, planning, risk and challenges of the project manager; alternative organizational structures; control and planning of time, money and technical resources.

Target Audience

Designed for engineers and other technical professionals at all levels, and new project managers responsible for small as well as large and long duration projects.

Fee

\$2,395

Includes instruction, a course notebook, *Project Management: A Systems Approach to Planning, Scheduling, and Controlling*, by Harold Kerzner, refreshments and five lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Management and Systems Track. See page 6.

Day One

- Survey and benchmark, understanding project management, leadership, obstacles to successful projects, definition of teams
- Project definition and distinguishing characteristics, resources, project management process, typical problems, the triple constraint, obstacles, project outcomes, use of project teams
- Strategic issues, proposals, starting successful projects, contract negotiation, international projects and the true benefits of teamwork
- Participant program or project plans identified

Day Two

- Internal project planning, issues, working with the customer, use of software, team decision making, planning hazards
- Work breakdown structure, statement of work, choosing team players
- Time estimating and scheduling, other planning methods, graphical tools, time estimating, productive meetings, meeting record keeping, goals of meetings

Day Three

- Network diagrams, team improvement activities, designate project teams
- Cost estimating, project cost system, resources, time vs. cost trade off
- Contingency, risk, cost/schedule control, project organization, informal organization, organizational forms, team strategies, team development and traditional management

Day Four

- Project team, sources of people, compromise, control, support team, coordination, interaction, subcontractors, team dynamics, team success, team development and traditional management role of internal project manager, theories of motivation, stimulating creativity, working through group problems

Day Five

- Project cost reporting, computers, project changes, handling changes, team building exercises
- Project or program plans presented by participants; projects evaluated and rated
- Current trends in project management

A participant can expect to learn

- how to put together a program/project plan that fits management's needs;
- cost estimating, budgeting and project control;
- how to develop, use and motivate teams to complete successful projects;
- how to establish successful project communication;
- to control project time slip.

PROPULSION SYSTEMS FOR UAVS AND GENERAL AVIATION AIRCRAFT

Instructor: Ray Taghavi

Day One

- Overview: Fundamentals of aircraft propulsion systems, engine types and aircraft engine selection
- Aircraft reciprocating engines: spark ignition and diesel engines: theory and cycle analysis, four stroke and two stroke cycles; brake horsepower, indicated horsepower and friction horsepower; engine parameter, efficiencies, classifications and scaling laws; practical issues

Day Two

- Aircraft reciprocating engines (continued): components and classification: cylinder, piston, connecting rod, crankshaft, crankcase, valves and valve operating mechanism; lubrication systems, pumps, filters, oil coolers, etc.; induction system, supercharging, cooling (air and liquid), exhaust engine installation and compound engine; engine knocks (pre-ignition and detonation), aviation fuels, octane and performance number, backfiring and afterfiring

Day Three

- Aircraft reciprocating engines (continued): carburetion and fuel injection systems, FA DEC; magneto (high and low tension), battery and electronic ignition systems, ignition boosters and spark plugs
- Rotary engines: propeller: theory, types airfoils, material, governors, feathering, reversing, synchronizing, synchrophasing, de-icing, anti-icing and reduction gears

Day Four

- Small gas turbine engines: cycles, inlets, compressors, combustors, turbines, exhaust systems, thrust reversers and noise suppressors; turbojet, turboprop, turboshaft, turbofan and propfan engines

Day Five

- Engine noise: sources, suppression, measurement techniques and practical issues
- Foreign Object Damage (FOD): ice, sand, bird
- Engines for special applications: UAVs, RPVs, HALE, blimps

A participant can expect to learn

- the actual cycles of two and four-stroke cycle engines, diesels and gas turbines;
- how to select the appropriate engine for their piloted aircraft or UAV, based on the mission requirements;
- all engine components, their principles of operation and material;
- aircraft engine systems such as lubrication, ignition and carburetion (including FADEC);
- propellers (theory and practice), types, propeller related systems and reduction gears;
- aircraft fuels (AVGAS), related issues and availabilities;
- supercharging;
- engines for special operations.

Available as on-site course

Contact us for a no-cost, no obligation proposal for an on-site course:

Zach Gredlics
On-site Program Manager
E-mail aerosite@ku.edu
Phone 785-864-1066

Times/CEUs

Class time 35 hours

CEUs 3.5

Description

Provides in-depth understanding of state-of-the-art propulsion issues for UAVs and general aviation aircraft, including propulsion options, cycle analysis, principles of operation, systems, components, performance and efficiency calculations.

Target Audience

Designed for propulsion engineers, aircraft designers, aerospace industry managers, educators, research and development engineers from NASA, FAA and other government agencies.

Fee

Includes instruction and a course notebook.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Aircraft Design Track. See page 6.

RELIABILITY AND 1309 DESIGN ANALYSIS FOR AIRCRAFT SYSTEMS (Computer-based Course)

Instructor: David L. Stanislaw

Online Instruction

Available anytime

Course Number AA121490

Class time 28 hours

CEUs 2.8

Description

Covers requirements of FARs 23.1309, 25.1309, 27.1309 and 29.1309 from fundamental analysis techniques to system integration; includes construction of failure mode and effects analysis, criticality analysis and fault trees. Includes detailed review of SAE ARP 4754 and ARP 4761. Principles apply to all critical and essential aircraft systems.

Target Audience

Designed for Parts 23, 25, 27 and 29 system certification engineers, airframe system designers, FAA-Designated Engineering Representatives (DERs), aircraft certification personnel and military personnel procuring civil equipment.

Fee

\$1,445

\$35 (USD) shipping within the U.S.

\$95 (USD) shipping to Canada and other international locations.

Fee includes instruction online, two course notebooks, *Fault Tree Handbook*, by D.F. Haasl, and *SAE ARP 4761—Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment*.

The course notes are for participants only and are not for sale.

The course notebook and supplemental readings will be mailed upon receipt of payment.

Certificate Track

This course is part of the Aircraft Maintenance and Safety Track and Aerospace Compliance Track. See page 6.

Participants are guided through the 28 course sections and have the flexibility to complete the sections and readings on their own time within a six-month time frame. Interaction with the instructor and classmates takes place via threaded discussion and e-mail.

Lesson Sections and Title

1. National Transportation Safety Board Accident Statistics
2. Learning from an Analysis of Power Industry Accidents
3. AOPA Nall Report and Boeing Statistical Summary
4. Pilot Causes of Accidents—Dr. Milton Survey
5. Safety in Aviation—Dr. Ir. H. Wittenberg
6. Historical 1309 Rules
7. Understanding FAR 25.1309
8. Built-in—Test and Probability Perspective
Fault Tree Handbook
9. RTCA DO-167 Airborne Electronics Reliability
10. MIL—HDBK—217 Reliability Prediction of Electronic Equipment AFSC 7
Part Derating Guidelines
11. RAC Electronic Parts Reliability Data
12. RAC Nonelectric Parts Reliability Data
13. RAC Failure Mode/Mechanism Distributions
14. DOD—HDBK—763 Human Engineering Procedures Guide
15. DOT/FAA/RD—93/5 Human Factors for Flight Deck Certification
16. JAR—VLA—1309, FAR 23.1309 and FAR 25.1309 Review
17. FAA Advisory Circulars
18. SAE ARP4761 Safety Assessment Guidelines
SAE ARP4754 Guidelines
19. MIL—STD—1629 Procedures for Performing a Failure Mode, Effects and
Criticality Analysis
20. RTCA DO—178B Software Considerations in Airborne Systems
21. RTCA DO—254 Design Assurance Guidance for Airborne Electronic
Hardware
22. FAA Order N8110.37 Delegated Functions and Authorized Areas
23. FAA AC 23.1309 Equipment, Systems and Installations
24. AC 25.1309 System Design and Analysis
25. AMJ 25.1309 Advisory Material Joint
26. AC 25—19 Certification Maintenance Requirements
27. Databus Architectures and Interference
28. Electric Lavatory Heater Exercise

SOFTWARE SAFETY, CERTIFICATION AND DO-178B

Instructors: Jeff Knickerbocker and Leanna K. Rierson

This course may be taught by either instructor, based on his or her availability.

Day One

- Introductions and background
- Overview of existing standards related to software safety
- Tie between the system, safety and software processes
- History, purpose, framework and layout of DO-178B
- Reading the DO-178B Annex A Tables
- DO-178B planning process
- DO-178B development and integration/test processes—development objectives, high-level requirements, traceability, design (low-level requirements and architecture), code/integration, integration/test objectives, normal and robustness testing

Day Two

- DO-178B verification processes—overview of verification, verification of requirements, design, code and testing
- DO-178B configuration management, quality assurance and certification liaison processes—configuration management objectives and terminology, control categories, quality assurance (QA) objectives, DO-178B QA philosophy, SQA approaches, certification liaison objectives, DO-178B life cycle data

- Special topics related to DO-178B—partitioning and protection, structural coverage, dead and deactivated code, service history, Commercial-Off-The-Shelf (COTS) software

Day Three

- FAA software-related policy and guidance—software review process, user-modifiable and field-loadable software, change impact analysis, tool qualification, previously developed software, software reuse, integrated modular avionics, databases (DO-200A), complex hardware (DO-254)

Day Four

- Assessing compliance to DO-178B—the Software Job-Aid
- Common pitfalls in applying DO-178B
- Software challenges facing the aviation industry: object-oriented technology, off-shore development, model-based development, increased use of verification and development tools, use of real-time operating systems and other commercially available components, software reuse

A participant can expect to

- develop and document efficient RTCA/DO-178B compliant processes;
- create, capture and implement compliant requirements, design data and source code;
- evaluate compliance to RTCA/DO-178B and understand the upcoming changes in RTCA/DO-178C and its supplements;
- generate and adhere to effective verification strategies;
- understand FAA's software-related policy and guidance.

Location

Location Orlando, Florida

Date November 6–9, 2012

Course Number AA131250

Times/CEUs

Tuesday–Friday 8 a.m.–4 p.m.

Class time 28 hours

CEUs 2.8

Description

Provides the fundamentals of developing and assessing software to the standard RTCA/DO-178B (and the upcoming DO-178C) Software Considerations in Airborne Systems and Equipment Certification. Also provides insight into the FAA's software review process, the FAA's software policy, practical keys for successful software development and certification, common pitfalls of software development and software challenges facing the aviation community. Practical exercises and in-class activities will be used to enhance the learning process.

Target Audience

Designed for software developers, avionics engineers, systems integrators, aircraft designers and others involved in development or implementation of safety-critical software. The focus is on civil aviation, certification and use of RTCA/DO-178B; however, the concepts may be applicable for other safety domains, such as military, medical, nuclear and automotive.

Fee

\$2,095

Includes instruction, a course notebook, the *RTCA/DO-178B Software Considerations in Airborne Systems and Equipment Certification*, refreshments and four lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Avionics and Avionic Components Track. See page 6.

STRUCTURAL COMPOSITES

Instructors: Max U. Kismarton, Richard Hale and Mark S. Ewing

This course may be taught by any of the instructors, based on his availability.

Location

Location San Diego, California

Date September 17–21, 2012

Course Number AA131130

Times/CEUs

Monday–Friday 8 a.m.–4 p.m.

Class time 35 hours

CEUs 3.5

Description

An excellent introduction to composite materials, covering both engineering and manufacturing of composite parts and assemblies. Class starts with the basic material properties of the constituents (fiber and matrix), how they combine to form plies and how to obtain ply properties, how plies combine to form laminates and how to obtain the laminate properties. The rest of the engineering topics include analysis and testing methods. To further reinforce the learning process, a healthy dose (20–30 case studies and lessons learned) are discussed. Towards the end of the week, the class becomes more participatory in nature, as the class breaks up into 4–5 person teams, each working on design projects aimed at building confidence with the material and cover areas of special interest or weakness. The teams will be asked to produce a preliminary design package consisting of drawings and sketches, loads, stress and weight analysis, material selection, fabrication process description, tool design, and preliminary cost and production rate analysis.

Target Audience

The course has proven very helpful to (1) those wanting a broad overview and/or a crash course in composites, (2) experienced engineers looking for a refresher course, (3) stress engineers wanting to understand how composites really work or fail and what to look out for when analyzing parts, data and margins, (4) practicing engineers and managers with metal experience wishing to expand their skill set, (5) anyone wanting to jump into the field but does not know how to go about it, and (6) engineering teams embarking on new projects involving composites.

Fee

\$2,395

Includes instruction, a course notebook, *Composite Airframe Structures*, by Michael Niu, refreshments and five lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Aircraft Structures Track. See page 6.

Day One

- Introduction/historical review of composites usage
- Constituent materials—fibers, matrix
- Analysis tools/formulas to predict mechanical properties of fibers, resins, plies
- Manufacturing introduction (non-aerospace)

Day Two

- Analysis tools/formulas to predict laminate (stack) elastic properties (classical lamination theory, ABD matrices)
- Constituent materials—weaves, foam and honeycomb cores, adhesives
- Coupon level testing methods, how to use and interpret the data
- Manufacturing discussions (aerospace)
- Discussion on sandwich cores, adhesives, fasteners

Day Three

- Failure theories and their limitations, proper use of the theories.
- Inspection methods
- Manufacturing discussions (cure cycles, processing, defects, inspection)
- Tooling design, issues, materials, costs
- Bonded and bolted joints, how to design and analyze

Day Four

- Composite laminate/part/assembly design guidelines
- Lamination rules
- Hygro-thermal effects
- Interlaminar and free-edge effects
- Durability/environmental issues (impact, fatigue, temp, humidity, EME)
- Design problems

Day Five

- Software tools for stress, manufacturing
- Design project continued
- Summary and wrap-up

SUBCONTRACT MANAGEMENT IN AEROSPACE ORGANIZATIONS

Instructor: Robert Ternes

Day One

- Overview of course goals and discussion of intended outcomes
- Discussion of typical aerospace environment and needs
- Review of contents of agreement
- Discussion of risk mitigation techniques
- Discussion of negotiation tools
- Cost limitations
- How to clarify communication issues
- How to identify and manage schedule considerations
- How to identify and implement opportunities
- Class exercise/summary of day

Day Two

- Tasks to perform during contract execution
- Tools and techniques used to measure and control quality and progress
- Corrective actions: when, why and how
- Risk management techniques
- Cost and schedule considerations during execution phase
- Communications upward, downward and horizontally
- Class exercise/summary of day

Day Three

- Delivery considerations
- Contract close-out activities and the tools and techniques used
- Application of special quality activities such as First Article inspections
- Configuration management issues and tools
- Cost and risk limitation techniques
- Communication of status (when, how, what) to all parties
- Collection and sharing of lessons learned
- Class exercise/summary/evaluation

A participant can expect to learn

- critical items that should be in every subcontract;
- ways to measure subcontractor effectiveness;
- better ways to create management and progress reports;
- methods to improve the effectiveness of the subcontract manager;
- techniques to recover when problems occur.

Location

Location San Diego, California

Date September 18–20, 2012

Course Number AA131140

Times/CEUs

Tuesday–Thursday 8 a.m.–4 p.m.

Class time 21 hours

CEUs 2.1

Description

As more large aerospace organizations turn to specialized companies to provide specialized, cutting edge components and subcomponents, management of subcontractors is a significant challenge. On the upside, this reliance on subcontractors brings the latest technology to the platform. This course discusses the challenges and provides proven methods to reduce the risks and costs associated with aerospace outsourcing and provides guidelines to increase effectiveness of the subcontractor. The processes, tools and techniques applied to managing lower-tier subcontracts are thoroughly covered.

Target Audience

Development or project managers responsible for managing the lower tier aerospace/aviation suppliers contracted to deliver product on schedule and within the required cost, quality and regulatory envelopes typical of an aerospace product.

Fee

\$1,795

Includes instruction, a course notebook, refreshments and three lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Management and Systems Track. See page 6.

SUSTAINMENT AND CONTINUED AIRWORTHINESS FOR AIRCRAFT STRUCTURES (NEW)

Instructors: Marv Nuss and Mark S. Ewing

Location

Location San Diego, California

Date September 10–13, 2012

Course Number AA131000

Times/CEUs

Monday–Thursday 8 a.m.–4 p.m.

Class time 28 hours

CEUs 2.8

Description

Introduction to aircraft sustainment and continued airworthiness requirements. Use of basic static, fatigue and damage tolerance analysis methods for repairs and alterations. Best practices for setting up fatigue management programs and documentation of instructions for continued airworthiness. Exposure to regulations, compliance policy and guidance, and technical references. Class exercises provide hands-on experience of simple analysis methods. Relevant reference material provided with class notes.

Target Audience

Designed for engineers, regulators, maintainers, inspectors and their managers working continued airworthiness design and compliance. Typical organizations are commercial and military aircraft OEM and operator sustainment groups, air logistics centers, repair stations and regulatory oversight agencies.

Fee

\$2,095

Includes course notebook, CD, refreshments and four lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Aircraft Structures Track, Aerospace Compliance Track and Aircraft Maintenance and Safety Track. See page 6.

Day One

- Background of sustainment requirements. Focus on evolution of FAA design, maintenance and inspection regulations related to continued airworthiness
- Overview of fatigue management programs (FMP) as they relate to structural sustainment. Similarity between civil and military requirements
- Static strength analysis for repairs and alterations, including a class exercise

Day Two

- Aircraft flight profiles and spectrum development for use in fatigue evaluations, including a class exercise
- Aircraft fatigue analysis for repairs and alterations using basic concepts – material properties, stress concentrations, Miner's rule. Class exercise
- Aircraft damage tolerance analysis for repairs and alterations using basic concepts – material properties, stress intensity, residual strength, crack growth. Class exercise

Day Three

- The importance of non-destructive evaluation for damage tolerance based inspection programs. Introduction to common methods and discussion about reliability and probability of detection (POD). Class exercise
- The importance of complete Instructions for Continued Airworthiness (ICA). Discussion of regulatory requirements and recommended ICA content
- FMPs – how static strength, fatigue strength, damage tolerance, inspection reliability and ICA fit together. Address widespread fatigue damage (WFD) and limitations of FMPs

Day Four

- Repair and alteration approvals using supplemental type certificates and field approvals. Return to service approvals, service difficulty reporting, major/minor repairs. How operators use MSG-3 process
- Corrosion as it relates to sustainment
- Continuing airworthiness for composite structure
- Risk assessment and risk management concepts
- Related topics, special issues, and wrap up

A participant can expect to

- become familiar with sustainment requirements;
- become familiar with technical methods for analysis;
- understand what technical evaluations are needed to comply with requirements;
- become familiar with the range of effects that influence airworthiness;
- know where to locate reference materials.

UNDERSTANDING AND CONTROLLING CORROSION OF AIRCRAFT STRUCTURES (Computer-based Course)

Instructors: John Hall, Carl E. Locke, Jr.

Day One

- Introduction to aircraft corrosion: Why is it important?
- Basic corrosion electrochemistry
- Corrosion environments
- Types of corrosion: Emphasis on those particular to aircraft
- High temperature corrosion: fundamentals and problems associated with aircraft
- Monitoring corrosion: basic methods
- Corrosion control methods: outline of methods used for aircraft structures

Day Two

- Corrosion control methods (continued)
- Materials construction for aircraft: properties and corrosion resistance
- Aircraft corrosion questions (Sections 1–8)
- Aircraft corrosion answers (Sections 1–8)
- Detection and remediation of corrosion: basic methods of finding and correcting corrosion problems
- Aircraft Corrosion Prevention and Control Programs (CPCPs): detailed description of CPCP development, originally defined by aging airplane programs

Day Three

- Aircraft Corrosion Prevention and Control Programs (continued)
- CPCP interpretations
- Military specifications pertaining to corrosion

Day Four

- Current and future airplanes: MSG-3 Revision 2 and CPCP requirements
- Aircraft maintenance procedures
- Aircraft corrosion questions (Sections 10–16)
- Aircraft corrosion answers (Sections 10–16)
- Group discussion

Online Instruction

Available anytime

Course Number AA121470

Class time 28 hours

CEUs 2.8

Description

Corrosion fundamentals are used as a basis for exploring manufacturing, inspection and maintenance procedures. Recently developed corrosion-related requirements and procedures for assuring continuous airworthiness of commercial airplanes are used as a basis for defining minimum maintenance requirements. Fundamentals and principles are also applicable to some military aircraft structures.

Target Audience

Designed for managers, engineers, maintenance and regulatory personnel in the commercial and, in some cases, military aircraft industry who are involved with evaluation or control of structural corrosion.

Fee

\$1,445

\$35 (USD) shipping within the U.S.

\$95 (USD) shipping to Canada and other international locations.

Includes instruction, a course notebook and *Principles and Prevention of Corrosion*, by Denny A. Jones.

The course notes are for participants only and are not for sale.

The course materials and log-in information will be mailed upon receipt of payment.

Certificate Track

This course is part of the Aircraft Maintenance and Safety Track and the Aircraft Structures Track. See page 6.

Questions? For more information about this computer-based course, please contact:

Kim Hunsinger: Assistant Director
E-mail kah@ku.edu • Phone 785-864-4758

UNMANNED AIRCRAFT SYSTEM SOFTWARE AIRWORTHINESS

Instructor: Willie J. Fitzpatrick, Jr.

Location

Location San Diego, California

Date September 18–20, 2012

Course Number AA131150

Times/CEUs

Tuesday–Thursday 8 a.m.–4 p.m.

Class time 21 hours

CEUs 2.1

Description

Covers the software airworthiness requirements for unmanned aircraft systems. Will address the development and airworthiness evaluation of complex integrated software intensive unmanned aircraft systems as well as the relationship between the acquisition/development processes for these systems and the key software airworthiness assessment processes. The course also identifies the artifact requirements and approaches for documenting the software airworthiness assurance case, which is required to ultimately provide the certification/qualification basis for approval of the airworthiness of the unmanned aircraft system.

Target Audience

This course is intended for managers, systems engineers, software system safety engineers and software engineers who design, develop or integrate unmanned aircraft systems or evaluate these systems to provide the qualification/certification basis for their software airworthiness.

Fee

\$1,795

Includes instruction, course notebook, CD, refreshments and three lunches.

The course notes are for participants only and are not for sale.

Certificate Track

This course is part of the Avionics and Avionic Components Track. See page 6.

Day One

- Introduction and overview of UAS software requirements
- Software acquisition/development and relationship to software airworthiness in unmanned aircraft systems
- Software airworthiness in the context of the system safety/airworthiness program
- Software airworthiness products during the system life-cycle
- Software airworthiness assessment process during the system life-cycle

Day Two

- Assessment of planning and requirements analysis
- Assessment of preliminary and architectural design
- Assessment of detailed design
- Assessment of coding and unit test
- Assessment of software integration and formal qualification test
- Assessment of system integration test and aircraft integration/ground test/flight test

Day Three

- Develop recommendations for formal flight release/airworthiness release to approval authority
- Documenting the UAS software airworthiness assurance case
- Useful guidebooks, handbooks and procedures in UAS software airworthiness
- Keys to successful software airworthiness process implementation for UAS
- Problem areas and concerns
- Future trends in UAS software airworthiness

A participant can expect to learn

- the key elements required to evaluate or achieve the successful airworthiness substantiation of Unmanned Aircraft System software;
- techniques and approaches for documenting and evaluating the software substantiation/safety case for acceptance by the Unmanned Aircraft System Airworthiness Qualification/Certification Authority;
- the application of acquired knowledge and skills to real world scenarios.

OUR OUTSTANDING INSTRUCTORS

Robert D. Adamson

FAA Certification Procedures and Airworthiness Requirements as Applied to Military Procurement of Commercial Derivative Aircraft/Systems, p. 34

FAA Functions and Requirements Leading to Airworthiness Approval, p. 36

Robert D. Adamson is a private consultant with more than 27 years of experience in the design, certification and management of FAR Part 23 and Part 25 aircraft projects. He was employed by Raytheon Aircraft for 15 years, holding positions of propulsion engineer, system safety engineer, Designated Engineering Representative (DER) and Airworthiness Engineer (AR) before joining the FAA in 1998. During his FAA tenure, he held positions as a propulsion specialist and program manager for Continued Operational Safety in the Wichita Aircraft Certification Office prior to retiring in January 2011. Adamson is an FAA DER in propulsion system installations. He has a B.S. from Southwestern and has completed post-graduate requirements from Embry-Riddle University.

Willem A.J. Anemaat

Airplane Flight Dynamics: Open and Closed Loop, p. 22

Airplane Preliminary Design, p. 24

Airplane Subsonic Wind Tunnel Testing and Aerodynamic Design, p. 25

Willem A.J. Anemaat is president and co-founder of Design, Analysis and Research Corporation (DARcorporation), an aeronautical engineering and prototype development company. DARcorporation specializes in airplane design and engineering consulting services, wind and water tunnel testing and design and testing of wind energy devices. His primary duties involve supervising all DARcorporation engineering design activities and the day-to-day guidance of all programming, support and sales activities. Anemaat is the software architect for the Advanced Aircraft Analysis software, an airplane preliminary design tool. He has been actively involved with more than 300 airplane design projects and has run many subsonic wind tunnel tests for clients. Anemaat has more than 20 publications in the field of airplane design and analysis, including the to-be published book: *Airplane Design: A Systematic Approach*, authored with Jan Roskam and Ronald Barrett, and has a patent to his name for a new wind gauge. He is the recipient of the SAE 2010 Forest R. McFarland Award, a member of

the AIAA Aircraft Design Technical Committee, an AIAA Associate Fellow and an associate editor for the *AIAA Journal of Aircraft*. Anemaat holds an M.S.A.E. degree from the Delft University of Technology in The Netherlands and a Ph.D. in aerospace engineering from The University of Kansas.

Mario Asselin

Airplane Performance: Theory, Applications and Certification, p. 23 (computer-based course)

Operational Aircraft Performance and Flight Test Practices, p. 46

Mario Asselin is chairman of Asselin, Inc., a company that provides engineering services in performance, stability and control. He is manager flight test team for the CSeries activity for Bombardier Flight Test Center in Wichita, KS, and is an FAA flight analyst DER.

Asselin previously held positions as senior manager of engineering flight test with Honda Aircraft Corporation, vice president of engineering with Sino Swearingen Aircraft Corporation, Learjet's chief of stability and control at the Bombardier Flight Test Center in Wichita, chief technical for the aerodynamic design and certification of Bombardier's CRJ-900 and Transport Canada DAD. He has taught courses for the Royal Military College of Canada, McGill University and Concordia University in Montreal. He is the author of *An Introduction to Aircraft Performance*. Asselin holds a B.E. in mechanical engineering from the Royal Military College of Canada and an M.Sc.A. in aerothermodynamics from École Polytechnique of Montreal.

William Barott

Fundamental Avionics, p. 41

William Barott is an assistant professor of electrical engineering at the Embry-Riddle Aeronautical University in Daytona Beach, Florida. He has expertise in electromagnetics, antennas, phased arrays and RF systems. He is currently engaged in research on orbital determination and radio astronomy with the SETI Institute and low-emission vehicles with General Motors through the EcoCAR Challenge. Prior to teaching at Embry-Riddle, he earned his B.S., M.S. and Ph.D. in electrical engineering from the Georgia Institute of Technology.

Richard L. Bielawa**Fundamentals of Rotorcraft Vibration, p. 42**

Richard L. Bielawa, president of R.L. Bielawa Associates, Inc., has consulted for numerous aerospace companies in diverse areas relating to rotary-wing structural dynamics and aeroelasticity, wind energy systems development and the flight dynamics of spacecraft. Bielawa has more than 40 years of experience in teaching and industrial and academic-based research. He served as lecturer in the department of mechanical and aerospace engineering at UCLA, senior research engineer at the department of aerospace engineering at the Georgia Institute of Technology and associate professor in the department of mechanical engineering, aeronautical engineering and mechanics at Rensselaer Polytechnic Institute. Previously, Bielawa was a senior research engineer at United Technologies Research Center. He holds a B.S.E. from the University of Illinois and an M.S.E. from Princeton University, both in aerospace engineering, and a Ph.D. from the Massachusetts Institute of Technology in aeronautics and astronautics engineering.

Brian Butka**Fundamental Avionics, p. 41**

Brian Butka is an associate professor of electrical, computer, software and systems engineering at the Embry-Riddle Aeronautical University in Daytona Beach, Florida. His research interests are in autonomous aerial vehicles, safety-critical hardware design and advanced passive radar applications. He has more than 12 years of analog/mixed signal and VLSI circuit design experience at Integrated Device Technology (IDT) where he was a principal engineer. Prior to IDT, he was an assistant professor for six years at the United States Naval Academy. He has also served as an adjunct professor at Georgia Institute of Technology. Earlier in his career, he was process design engineer at Westinghouse Electric Corporation and product engineer at Texas Instruments. Butka has a B.S. in electrical engineering from Syracuse University, and an M.S. and Ph.D. in electrical engineering, both from Georgia Institute of Technology.

Armand Chaput**Conceptual Design of Unmanned Aircraft Systems, p. 31**

Armand Chaput is an adjunct professor in aerospace engineering and engineering mechanics at the University of Texas at Austin where he teaches unmanned air system engineering design and serves as director of the Air System Engineering Laboratory. He is retired from Lockheed Martin Aeronautics Company where he was a senior technical fellow and member of the air system design and integration technical staff. While at Lockheed Martin Aeronautics, he supported a range of advanced technology programs, most recently as weight czar and chief weight control engineer for the F-35 Joint Strike Fighter Program. He has served as a member of the USAF Scientific Advisory Board, the Naval Studies Board of the National Academy and the Board of Trustees for the Association for Unmanned Vehicle Systems International. He is the 2003 recipient of the SAE Clarence L. "Kelly" Johnson Aerospace Vehicle Design and Development Award. He is a Fellow of the AIAA, an instrument-rated commercial pilot and flight instructor. Chaput holds a B.S., M.S. and Ph.D. from Texas A&M University, all in aerospace engineering.

Robert Chupka**Fundamental Avionics, p. 41**

Robert Chupka is the senior aerospace avionics and electrical systems engineer with the systems and equipment branch of the FAA Atlanta Aircraft Certification Office. He has more than 32 years of professional experience within the aerospace industry, including military and commercial avionics systems. Chupka joined the FAA in 2001. His primary responsibilities include systems certification of advanced avionics and electrical systems for commercial aircraft. Prior to joining the FAA, he worked for ARINC, Inc., General Dynamics and Sanders Associates and has been extensively involved in all facets of engineering and management for commercial and military airborne, sea-based and ground-based systems. Chupka received a B.S. in physics from the Rochester Institute of Technology and an M.S. in electrical engineering from Northeastern University.

Richard Colgren

Conceptual Design of Unmanned Aircraft Systems, p. 31

Richard Colgren is a former associate professor of aerospace engineering at the University of Kansas and is vice president of Viking Aerospace. Previously, he was a senior staff engineer at Lockheed Martin in Palmdale, California. He has 27 years of professional experience within the aerospace industry, including previous aircraft design and development research at Northrop. He has been an adjunct professor at the University of Southern California and California State University, Fresno. His research focus is on intelligent vehicle systems and controls. Colgren is an Associate Fellow of AIAA, has more than 130 publications and holds two patents, with two patents pending. Colgren received a B.S. in aeronautical and astronautical engineering from the University of Washington, an M.S. in electrical engineering from the University of Southern California and a Ph.D. in electrical engineering, with an emphasis in systems and a minor in aerospace engineering, from the University of Southern California.

Ernie Condon

Airborne Equipment Design and RTCA DO-160, p. 17

Aircraft Lightning: Requirements, Component Testing, Aircraft Testing and Certification, p. 19

Ernie Condon has 28 years of engineering experience with Hawker Beechcraft. He is a certification engineer (DER) in the HIRF/lightning field for Part 23 and Part 25 aircraft, with considerable experience in the certification of carbon fiber aircraft. In addition, he has been a consultant DER in HIRF/lightning and conducted training in electromagnetic effects to departments within Hawker Beechcraft. Condon is a research consultant at WSU/National Institute for Aviation Research for characterization of electromagnetic effects to carbon fiber aircraft. Condon received a B.S. in electrical engineering from Wichita State University.

George Cusimano

Flight Test Principles and Practices, p. 39

Flight Testing Unmanned Aircraft—Unique Challenges, p. 40

George Cusimano has more than 40 years of experience in test engineering, technical management, systems engineering and program management concentrated in research, development and the implementation of nationally important leading edge technologies. He has a strong background in flight testing complex, high technology weapons systems, such as the F-117, B-2, X-33 (single stage to orbit prototype), DarkStar UAV and X-35 (JSF prototype). Cusimano is currently serving as a highly qualified expert and technical advisor for the United States Air Force. Prior to this assignment he participated in every aspect of T&E from a practicing flight test engineer to managing a combined test force as the Deputy Director of Joint STARS CTF to leading a large T&E enterprise as the Director of Flight Test at the Lockheed Martin Skunk Works. He retired from the United States Air Force as a colonel after 24 years of service and has worked in the aerospace industry for the past 15 years prior to his government current posting. Cusimano holds a B.S. in mechanical engineering and an M.S. in industrial engineering from Arizona State University. He is a graduate of the USAF Test Pilot School. He is a Fellow of the Society of Flight Test Engineers. Cusimano is also the chief operating officer for Vector LLC, a flight test and aviation consulting company.

Bill Donovan

Conceptual Design of Unmanned Aircraft Systems, p. 31

Bill Donovan is a president of Pulse Aerospace, LLC in Lawrence, Kansas. While doing graduate work at the University of Kansas, Donovan worked as a research assistant in the KU Flight Test Laboratory and worked as the chief designer of the Meridian unmanned aircraft system, a 1,100 lb., 26 foot wingspan UAS designed to measure ice thickness and bed surface topology in Antarctica and Greenland.

Donovan has worked on the development of several new unmanned aircraft systems, including the Hawkeye UAS, the Wolverine helicopter UAS and the Aggressor II helicopter UAS. His areas of expertise are in aircraft conceptual, preliminary and detailed design stability and control, structural dynamics and project management. Donovan holds a B.S. and M.S. in aerospace engineering from the University of Kansas and is currently completing a doctorate of engineering program in aerospace engineering at KU.

David R. Downing

Digital Flight Control Systems: Analysis and Design, p. 32

David R. Downing is a professor emeritus of aerospace engineering at the University of Kansas. He taught courses and did research in advanced flight control, instrumentation systems and flight testing. Downing was formerly an aerospace engineer at NASA Langley Research Center, a systems engineer at the NASA Electronics Research Center and an assistant professor of systems engineering at Boston University. He received a B.S.E. in aerospace engineering and an M.S.E. in instrumentation engineering from the University of Michigan. He also earned an S.C.D. in instrumentation engineering from the Massachusetts Institute of Technology.

Mark S. Ewing

Aircraft Structures Design and Analysis, p. 21

Structural Composites, p. 54

Sustainment and Continued Airworthiness for Aircraft Structures, p. 56

Mark S. Ewing is chairman of the aerospace engineering department and director of the Flight Research Laboratory at the University of Kansas. Previously, he served as a senior research engineer in the structures division at Wright Laboratory, Wright-Patterson Air Force Base, and as an associate professor of engineering mechanics at the U.S. Air Force Academy. His research interests include structural vibrations and structural acoustics, especially as related to carbon fiber-reinforced composites. Ewing is a past recipient of the University of Kansas School of Engineering Outstanding Educator Award. He holds a B.S. in engineering mechanics from the U.S. Air Force Academy, an M.S. in mechanical engineering and a Ph.D. in engineering mechanics, both from Ohio State University.

Willie J. Fitzpatrick, Jr.

Unmanned Aircraft System Software Airworthiness, p. 58

Willie J. Fitzpatrick, Jr., has more than 35 years of experience in the software/systems engineering area. His experience includes the development and assessment of automatic control systems, systems engineering and software engineering on various aviation and missile systems. He is currently serving as Chief of the Aviation Division, in the Software Engineering Directorate of the U.S. Army Research, Development, and Engineering Command's Aviation and Missile Research Development and Engineering Center. Fitzpatrick is responsible for the management of life cycle software engineering support and software airworthiness assessments for several aviation systems, including Apache, Blackhawk, Chinook and Kiowa aircrafts and unmanned aircraft systems. He has co-authored several technical reports and publications.

Fitzpatrick is a member of the IEEE, Armed Forces Communications and Electronics Association, Association of United States Army, American Society for Engineering Management, The International Council on Systems Engineering, The American Helicopter Society and the Systems Safety Society. He was recognized as the IEEE Huntsville Section Outstanding Engineer for 2002 and served in various officer capacities for the IEEE Huntsville Section,

including Section Chair for 2007 and 2008. Fitzpatrick holds a B.S. in electrical engineering from Tuskegee University, an M.S. in electrical engineering from Stanford University and a Ph.D. in industrial and systems engineering from the University of Alabama–Huntsville.

Bill Goodwine

Applied Nonlinear Control and Analysis, p. 26

Bill Goodwine is an associate professor in the department of aerospace and mechanical engineering at the University of Notre Dame. His research and teaching focus on nonlinear control and dynamical systems, with particular emphasis on geometric methods and hybrid systems. He received his M.S. and Ph.D. from the California Institute of Technology. He was the recipient of a National Science Foundation CAREER award and numerous departmental, college, university and ASEE teaching awards.

Richard Hale

Structural Composites, p. 54

Richard Hale is an associate professor in the department of aerospace engineering at the University of Kansas. His expertise is in engineering mechanics, experimental mechanics and composite materials and structures. Hale was a senior project engineer for The Boeing Company from 1989 to 1998, where he worked on composite design and analysis processes, fiber placement and structural concepts in advanced design. Hale holds three U.S. and one international patent for composite design processes and has more than 30 publications related to composite materials and structures. Hale was a Bellows Scholar for the KU School of Engineering and has received multiple teaching awards, including being named the Outstanding KU Aerospace Engineering Educator, the Gould Award for Outstanding Education and Advising in Engineering and the W.T. Kemper Fellowship for Teaching Excellence. He was also a recipient of the KU School of Engineering Miller Professional Development Award for distinguished research in the engineering profession. Hale is an Associate Fellow of AIAA and is a member of SAE, SEM, SAMPE and ASEE. He received his B.S. in aerospace engineering from Iowa State University, his M.S. in mechanical engineering from Washington University St. Louis and his Ph.D. in aerospace engineering and engineering mechanics from Iowa State University.

John Hall

Durability and Damage Tolerance Concepts for Aging Aircraft Structures (computer-based course), p. 33

Understanding and Controlling Corrosion of Aircraft Structures (computer-based course), p. 57

John Hall began his career in England before joining The Boeing Company in 1966 as a fatigue analysis specialist on the 747. Later he joined a group of specialist engineers responsible for developing company-wide design, analytical procedures and training programs for fatigue, damage tolerance and corrosion control. He was a member of structures working groups responsible for developing new and aging airplane structural maintenance and inspection programs. He was made a Technical Fellow of The Boeing Company for his contributions.

Albert Helfrick

Fundamental Avionics, p. 41

Albert Helfrick is the former chair of the electrical and systems engineering department at Embry-Riddle Aeronautical University. Previously, he was director of engineering for Tel-Instrument Electronics, a manufacturer of avionics test equipment. Before entering academia, he was a self-employed consulting engineer for four years where he and his company designed fire and security systems, consumer items and avionics. He has 48 years of experience in various areas of engineering including communications, navigation, precision testing and measurement, radar and security systems. He performed radiation hardening on military avionics, designed test equipment for the emerging cable television industry, designed general aviation avionics for Cessna Aircraft and precision parameter measuring and magnetic systems for Dowty Industries. Helfrick is the author of 12 books, numerous contributions to encyclopedias, handbooks and other collections. He has more than 100 technical papers and presentations, served as an expert witness in a number of civil cases and testified before Congress. He holds four U.S. patents, is a registered professional engineer in New Jersey, a Life Senior Member of the IEEE, and an associate fellow of the AIAA. He holds a B.S. in physics from Upsala College, M.S. in mathematics from New Jersey Institute of Technology and a Ph.D. in applied science from Clayton University.

Tim Iacobacci

Acquisition of Digital Flight Test Data from Avionics Buses: Techniques for Practical Flight Test Applications, p. 12

Tim Iacobacci is a professional engineer currently working as a software matter expert for the F22 program. He has worked in the aviation industry for more than 28 years, including work at Northrop as a flight test engineer. There he also aided in troubleshooting MIL STD 1553B data buses. His background in software simulation includes developing scene generation hardware and software on the Shuttle Engineering Simulator. He served as a senior aircraft maintenance engineer at United Airlines, designing and producing the STC paperwork for the installation of multiple GPS systems, Satcom and cockpit weather information system. He holds a B.S. in aerospace engineering, a B.S. in computer science from Brooklyn Polytechnic University and an M.S. in electrical engineering from Fresno State.

Wally Johnson

Aircraft Structural Loads: Requirements, Analysis, Testing and Certification, p. 20

Principles of Aerospace Engineering, p. 48

Wally Johnson is a senior loads engineer at Boeing BDS in Wichita. His responsibilities include design, fatigue, static and dynamic loads analysis. Johnson has 23 years of loads experience. Previously, he served as a technical specialist and an FAA DER at Raytheon Aircraft Company. He was the lead static loads engineer on the Hawker 4000 business jet. He has served as a member of the Aviation Rulemaking Advisory Committee group working to harmonize the FARs and JARs in the area of loads and dynamics. Johnson also has worked as a senior loads engineer at Learjet. He holds a B.S. and M.S. in aerospace engineering from Wichita State University. Johnson is a structural loads consultant DER for FAR 23 and FAR 25 categories.

Marge Jones

Commercial Aircraft Safety Assessment and 1309 Design Analysis, p. 29

Marge Jones is a system safety consultant specializing in commercial aircraft certification. She has been an FAA DER for safety and reliability for structures, power plant, and systems and equipment for the past 20 years. She is also a certified safety professional in system safety. Jones provides safety consultant/product safety services to the aircraft industry and has been involved in a variety of STCs and TCs, many requiring specialized safety assessments. Her area of safety consultation includes defining system architecture and detailed design and safety requirements, performing safety analyses, developing design solutions to safety related issues and evaluating and/or preparing certification documentation for regulations compliance. She has worked on numerous aviation projects including aircraft thrust reverser systems, passenger-to-cargo conversions, smoke detection/fire suppression systems, rotorcraft medical LOX system, display/avionics suite systems, pressurization systems and engine control systems. Jones also has several years of safety engineering experience with defense systems and NASA payloads. She holds a B.S. in safety engineering from Texas A&M University and an M.S. in systems management from Florida Institute of Technology.

Max U. Kismarton

Structural Composites, p. 54

Max U. Kismarton is an aircraft designer and a Technical Fellow at The Boeing Company, with extensive hands-on experience in engineering (design, loads, stress, weights, testing, advanced metals and composites), manufacturing (tooling, processes, machinery, shop management) and management (cost engineering and estimating, lean manufacturing, project/program management). He is currently working in the materials and processes group, heading up multiple research and development projects on micromechanical behavior and hybrid laminates, and high performance wing box structures for present and future commercial aircrafts. He has designed and built composite airframe primary structure for small and large composite aircrafts such as Amber, Gnat, High Speed Civil Transport, F-16XL-2, Shadow, ERAST, Hummingbird, UCAV X-45 and the 787 Dreamliner. Kismarton holds a B.S. in aerospace engineering from the University of Kansas.

Jeff Knickerbocker

Complex Electronic Hardware Development and DO-254, p. 30

Software Safety, Certification and DO-178B, p. 53

Jeff Knickerbocker is a consulting DER with nearly 30 years of experience as a systems/software engineer. He has led technical teams in designing, developing and verifying real-time embedded software and AEH devices. In addition to industry affiliations, he also provides consulting and training services to the FAA and other non-US regulatory agencies. In 2002, he and his wife started Sunrise Certification & Consulting. Knickerbocker has a B.S. in physics and an M.S. in software engineering.

Carl E. Locke, Jr.

Understanding and Controlling Corrosion of Aircraft Structures (computer-based course), p. 57

Carl E. Locke, Jr., is former dean and professor emeritus in the School of Engineering at the University of Kansas, where he served as dean for almost 17 years and professor of chemical and petroleum engineering for three years. He currently is involved in accreditation of engineering programs in the United States. His research interests are in the corrosion of steel in concrete. Locke is co-author of *Anodic Protection: Theory and Practice in the Prevention of Corrosion*. Previously, he served as director of the School of Chemical Engineering and Materials Science at the University of Oklahoma. He was named a distinguished engineering graduate by the College of Engineering at the University of Texas and was a recipient of the Distinguished Engineering Service Award from the School of Engineering at the University of Kansas. He is a Fellow of the American Institute of Chemical Engineers, the National Society of Professional Engineers and the American Society for Engineering Education. Locke holds a B.S., M.S. and Ph.D. in chemical engineering from the University of Texas at Austin.

Michael Mohaghegh

Aircraft Structures Design and Analysis, p. 21

Michael Mohaghegh is a Boeing Technical Fellow in Stress Analysis and Technology Support, with 44 years of experience in designing and analyzing aircraft structures (707, 737, 747, B1, 767, 777, 787) and developing technology needs, roadmaps and design standards. He is the chief editor for the Boeing Composite Design manuals and is the developer and instructor for courses on static strength, design and analysis, finite element and fatigue, fracture and composites at The Boeing Company. Mohaghegh is the director of the Modern Aircraft Structures Certificate Program at the University of Washington. He also has taught classes for airlines, suppliers and universities in the U.S. and abroad. Previously, he was principal lead engineer, manager and FAA DER for the Boeing Company. Mohaghegh has published in the *Journal of Applied Mechanics*, *Journal of Aircraft*, *International Journal of Technical Sciences*, *International Journal of Mechanical Engineering Education*, and the Boeing *AERO* magazine. He received his B.S. and M.S. in structural engineering from the University of California, Berkeley, and his Ph.D. in engineering mechanics from the University of Washington.

Steven L. Morris

Aircraft Icing: Meteorology, Protective Systems, Instrumentation and Certification, p. 18

Steven L. Morris is a senior consultant for Engineering Systems, Inc., Colorado Springs, Colorado. Morris served as an officer and engineer in the U.S. Air Force for more than 24 years. His experience includes teaching, research and consulting in the areas of airplane design, stability and control, aerodynamics, flight simulation, aircraft icing and accident reconstruction. He is a co-author of *Introduction to Aircraft Flight Mechanics: Performance, Static Stability, Dynamic Stability, and Classical Feedback Control*. Morris is an Associate Fellow of AIAA and is a member and officer on the SAE Aircraft Icing Technology Committee. He received a B.S. in engineering sciences from the U. S. Air Force Academy, an M.S. in aeronautical engineering from the Air Force Institute of Technology and a Ph.D. in aerospace engineering from Texas A&M University.

Marv Nuss

Sustainment and Continued Airworthiness for Aircraft Structures, p. 56

Marv Nuss is an engineering consultant focusing on the airworthiness and sustainment aircraft structures. He has more than 38 years of experience in aircraft fatigue, damage tolerance and continued airworthiness. He has worked FAA Part 23, 25 and 27 and Army, Navy and Air Force projects. Nuss retired from the FAA in December 2011 after serving more than 20 years in a variety of roles at the Small Airplane Certification Directorate. He was most recently the Directorate's program manager for Continued Operational Safety and involved in a broad spectrum of continued airworthiness issues for all sizes and classes of aircraft.

Prior to joining the FAA, Nuss worked for 18 years as a structural fatigue analyst at Bell Helicopter and McDonnell Aircraft companies. Through McDonnell Douglas, he also spent a year with the CASA-Spain design team certifying their small transport airplanes to FAA Part 25 damage tolerance requirements. Nuss has a B.S. in aerospace engineering from the University of Kansas and did graduate study in engineering mechanics at the University of Texas–Arlington.

D. Mike Phillips

Aerospace Applications of Systems Engineering, p. 16

D. Mike Phillips is the CMMI program manager at the Software Engineering Institute, a federally funded research and development center sponsored by the U.S. Department of Defense and operated by Carnegie Mellon University. He led a team that created the CMMI Product Suite, successfully describing key practices for both systems and software engineering. He is the co-author of *CMMI-ACQ: Guidelines for Improving the Acquisition of Products and Services*. As an Air Force senior officer, Phillips led an Air Force program office's development and acquisition of the software-intensive B-2 Spirit stealth bomber using integrated product teams. He holds a B.S. in aeronautical engineering from the U.S. Air Force Academy, an M.S. in nuclear engineering from Georgia Tech, an M.S. in systems management from the University of Southern California, an M.A. in international affairs from Salve Regina College and an M.A. in national security and strategic studies from the Naval War College.

Ray Prouty

Helicopter Performance, Stability and Control, p. 43

Ray Prouty is a private consultant for the helicopter industry with more than 50 years of experience. He began his career at Hughes Tool Company and later at Sikorsky Aircraft as a helicopter aerodynamicist. Other positions he has held include: stability and control specialist, Bell Helicopters; group engineer-helicopter aerodynamics, Lockheed Aircraft; and chief, stability and control, Hughes Helicopters/McDonnell Douglas Helicopters. The author of the "Aerodynamics" column of *Rotor and Wing Magazine* for more than 20 years, Prouty also wrote *Helicopter Performance, Stability and Control*, a college textbook. He is an Honorary Fellow of the American Helicopter Society. Prouty holds a B.S. and M.S. in aeronautical engineering from the University of Washington.

Jim Reeves

FAA Conformity, Production and Airworthiness Certification Approval, p. 35

Jim Reeves joined the FAA Atlanta Manufacturing Inspection District Office (MIDO) in 1978 as an aviation safety inspector manufacturing. He then served as manager of the Atlanta Manufacturing Inspection District Office for 28 years. Major activities during his tenure with FAA included development of the FAA Designee Standardization Course, assigned ASI for Embraer San Jose Dos Campos, Brazil 1982–1987, FAA bilateral team to China in 1995 and Malaysia in 1996, ACSEP Team, England 1988, participation in the development of the Certificate Management Information Systems (CMIS) and participation in the development of the Aircraft Certification System Evaluation Program (ACSEP). Reeves participated in or was directly involved with 18 type certificate programs and production certificate issuances.

Leanna K. Rierson

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Integrated Modular Avionics (IMA) and DO-297, p. 44

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Leanna K. Rierson is an independent consultant in software, complex electronic hardware and integrated module avionics (IMA) development for safety-critical systems, with emphasis on civil aviation. She has more than 20 years of experience in

the software and aviation industry. Rierson spent nine years as a software and avionics specialist at the FAA, and five years as Chief Scientific and Technical Advisor for Aircraft Computer Software. Rierson also has held engineering positions at NCR and Cessna Aircraft Company. She has published numerous papers on safety-critical software, IMA and aviation; led many national and international engineering teams and workshops; and developed several software courses, policies, handbooks and guidance material for the FAA. She is an FAA DER with Level A authority in the software and complex hardware technical areas. She has worked with numerous aircraft and avionics companies, including Boeing, Cessna, Learjet, Embraer, Rockwell Collins, Honeywell, GE Aviation and Avidyne.

Rierson holds an M.S. degree in software engineering from Rochester Institute of Technology and a B.S. degree in electrical engineering from Wichita State University.

Jan Roskam

Airplane Performance: Theory, Applications and Certification (computer-based course), p. 23

Jan Roskam is the emeritus Ackers Distinguished Professor of Aerospace Engineering at the University of Kansas. His university honors include the 2003 Chancellors Club Career Teaching Award and five-time winner of Aerospace Engineering Educator of the Year selected by graduating seniors. In October 2007, Roskam received the prestigious AIAA Aircraft Design Award for Lifetime Achievement in airplane design, airplane design education, configuration design and flight dynamics education. The author of 15 textbooks, Roskam has had industrial experience with three major aircraft companies and has been actively involved in the design and development of more than 50 aircraft programs. He is a Fellow of AIAA and the Society of Automotive Engineers. Roskam received an M.S. in aeronautical engineering from the Delft University of Technology, The Netherlands, and a Ph.D. in aeronautics and astronautics from the University of Washington.

Wayne R. Sand

Aircraft Icing: Meteorology, Protective Systems, Instrumentation and Certification, p. 18

Aviation Weather Hazards, p. 27

Wayne R. Sand is an aviation weather consultant with expertise in aircraft icing tests, analysis of icing accidents and development of icing instrumentation. He also has extensive expertise in convective weather, winter weather and mountain weather. As former deputy director of the Research Applications Program at the National Center for Atmospheric Research, he developed aviation weather technology for the FAA. Previously, Sand was a member of the atmospheric science department at the University of Wyoming. He also conducted research on thunderstorms and convective icing while at the South Dakota School of Mines and Technology. Sand is co-holder of a patent on a technique for the remote detection of aircraft icing conditions. He holds a B.S. in mathematics and physical science from Montana State University, an M.S. in meteorology from the South Dakota School of Mines and Technology and a Ph.D. in atmospheric science from the University of Wyoming.

Keith Schweikhard

Acquisition of Digital Flight Test Data from Avionics Buses: Techniques for Practical Flight Test, p. 12

Keith Schweikhard is a research flight systems engineer at NASA Dryden Flight Research Center, supporting ongoing research on multiple research aircraft. He is currently heading up systems, development, integration and aerodynamic flight research activities on the Subsonic Research Aircraft Testbed. He has acted as the project chief engineer on the advanced aeroelastic wing aircraft, Autonomous Aerial Refueling Demonstrator. As a research flight systems engineer, Schweikhard has performed systems integration and test activities that include various fiber optic sensor and communications systems, Vehicle Health Monitoring, integration of multiple flight controls research activities using the production support flight controls computers and various electrical actuation experiments. While working on the B-2 stealth bomber at Northrop for nine years, he was responsible for the acquisition and analysis of PCM and extensive amounts of MIL-STD-1553 data. Schweikhard acted as a liaison between the acquisition and analysis engineers

and was intimately involved with identifying and solving data problems related to both groups. He also has worked data acquisition, integration and analysis issues on various other avionics test bed projects. Schweikhard received a B.S. degree in mechanical engineering from the University of Kansas.

Walt Silva

Modelling and Analysis of Dynamical Systems Using MATLAB, p. 45

Walt Silva is currently a senior research scientist at the NASA Langley Research Center. Silva's interests include computational methods, nonlinear dynamics and system identification. He received his B.S. in aerospace engineering from Boston University, his M.S. in aerospace engineering from the Polytechnic University (formerly known as the Polytechnic Institute of NY) and his Ph.D. in applied mathematics from the College of William & Mary.

David L. Stanislaw

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David L. Stanislaw is an independent consultant in avionics with emphasis on civil aviation. He held engineering assignments in airborne systems design and later assumed responsibility for avionics and electrical engineering at the airframe level. Stanislaw was an FAA DER for more than 15 years and has conducted seminars on all phases of aircraft electronics. The holder of several radar patents, Stanislaw was a member of RTCA and has participated in international symposiums. He held a commercial pilot rating. Stanislaw received a B.S. in electron physics from LaSalle College.

C. Bruce Stephens

Aircraft Lightning: Requirements, Component Testing, Aircraft Testing and Certification, p. 19

C. Bruce Stephens is an FAA DER consultant at Learjet and a consultant DER at his company, Stephens Aviation, with a wealth of experience in high intensity radiated fields (HIRF) and lightning. Stephens retired from Hawker Beech Craft after 28 years of service. He has HIRF/Lightning experience on both Part 23 and Part 25 including composite aircraft. Stephens is a Six-Sigma/Lean consultant developing implementation and training materials and teaches at a number of universities, including Webster University and Southwestern College. He also owns the company

Learning 4.U. Stephens has an executive M.B.A. and M.S. in management from Friends University and a B.S. in industrial technology from Wichita State University.

Wayne Stout

Flight Control and Hydraulic Systems, p. 38

Wayne Stout is an independent consultant with a technical specialization in design, analysis, simulation and certification of aircraft mechanical systems. He has more than 30 years of experience in aircraft mechanical systems as an independent consultant and at Bombardier Aerospace-Learjet, The Boeing Company and Honeywell. Stout has held positions of engineering specialist, systems integrator and chief engineer. His experience covers all design phases from concept to final product across commercial, military and space products. In addition, Stout has been an adjunct professor at Wichita State University and is an FAA DER in flight controls, hydraulics, ECS, pressurization and door mechanisms. Stout received a B.S. in mechanical engineering from the South Dakota School of Mines and Technology, an M.S. in aeronautical engineering from Wichita State University and a Ph.D. in engineering from Wichita State University.

Thomas William Strganac

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Principles of Aeroelasticity, p. 47

Thomas William Strganac is a professor of aerospace engineering at Texas A&M University. His research and engineering activities focus on aeroelastic phenomena, structural dynamics, fluid-structure interaction, limit cycle oscillations and related nonlinear mechanics. From 1975 to 1989, Strganac was a research engineer at NASA's Langley Research Center and an aerospace engineer at NASA's Goddard Flight Space Center. Strganac is an Associate Fellow of the AIAA and a registered professional engineer. He received a B.S. from North Carolina State University and an M.S. from Texas A&M University, both in aerospace engineering, and a Ph.D. in engineering mechanics from Virginia Tech.

Ray Taghavi

Propulsion Systems for UAVs and General Aviation Aircraft, p. 51

Ray Taghavi is a professor of aerospace engineering at the University of Kansas where he teaches courses in jet propulsion, rocket propulsion, aircraft reciprocating engines, fluid mechanics, aerodynamics, advanced experimental techniques and instrumentation. Previously, he was a research engineer at NASA Lewis Research Center conducting experimental research on supersonic jet noise reduction techniques, acoustic excitation of free shear layers and stability and control of swirling flows. He is the co-inventor and patent holder for a supersonic vortex generator. He is a Fellow of the American Society of Mechanical Engineers and an Associate Fellow of the American Institute of Aeronautics & Astronautics. He was the recipient of the Abe M. Zarem Educator Award from AIAA, the Ralph R. Teetor Educational Award from SAE, the John E. and Winifred E. Sharp Award from the KU School of Engineering, Henry E. Gould Award from KU School of Engineering and four-time winner of the Aerospace Engineering Outstanding Educator Award from the seniors of the department of aerospace engineering. Taghavi received an M.S. from Northrop University and a Ph.D. from the University of Kansas, both in aerospace engineering.

Robert Ternes

Subcontract Management in Aerospace Organizations, p. 55

Robert Ternes is a senior program manager at HighRely, Inc., and a consultant specializing in subcontract management for large aerospace organizations, aircraft certification and project management. He has provided subcontractor selection, direction and leadership for a wide range of companies including AAR Corporation, Crane Aerospace, BAE Systems, Raytheon Corporation, WindRiver, Ultra Electronics and Mectron. Prior to HighRely, he was a program manager at Honeywell International, program manager at Motorola, Inc., and a systems engineer at IBM. Ternes managed subcontractors in programs that included specialized semiconductors, cellular handsets, computer hardware and software, the Iridium space satellite system, custom air transport airframe modifications and several classified aerospace projects. His experiences also include software CMM and CMMI implementation and use in large programs, and system integration. Ternes has a B.S. in engineering and applied sciences from Yale University and a Program Management Professional (PMP) certification.

Gilbert L. Thompson

FAA Certification Procedures and Airworthiness Requirements as Applied to Military Procurement of Commercial Derivative Aircraft/Systems, p. 34

FAA Functions and Requirements Leading to Airworthiness Approval, p. 36

Gilbert L. Thompson is a private consultant in aircraft certification. He has more than 33 years of experience in domestic and international aircraft certification with the FAA. He also has served as a systems engineer; project manager; manager, Systems and Equipment Branch, Los Angeles Aircraft Certification Office; and assistant manager, Transport Airplane Directorate. His certification experience includes the Robinson R22/R44 rotorcraft, Lockheed L1011, McDonnell Douglas DC-8, DC-9, DC-10, MD-80, MD-90, KC-10A, MD-11, MDHI 369/500NOTAR, MDHI 600, MDHI 900, the first concurrent and cooperative joint FAA/Joint Aviation Authorities certification of the Boeing 717-200, and development of the criteria for civil certification of the military Globemaster C-17. In 1999, he was the recipient of the Aviation Week and Space Technology Laurels Award for outstanding achievement in the field of aeronautics/propulsion. He holds a B.S. in aerospace engineering from the University of Michigan and a B.A. in mathematics from Bellarmine University, Louisville, Kentucky.

Herbert Tuttle

Project Management for Aerospace Professionals, p. 50

Herbert Tuttle has been an assistant professor and the director of the engineering management graduate program at the University of Kansas Edwards Campus for the past 15 years. In his previous 20 years of professional practice, he was a management consultant, project manager, project engineer and manufacturing manager with various Fortune 500 companies. He received undergraduate degrees in electrical and industrial engineering from the State University of New York at Alfred and Buffalo, an M.B.A. from the University of Kansas, an M.S. in engineering management from the University of Tennessee and an M.S. in industrial engineering from Illinois State University. He is currently working on his dissertation.

Case (C.P.) van Dam

Aerodynamic Design Improvements: High-Lift and Cruise, p. 14

Case (C.P.) van Dam is the Warren and Leta Giedt endowed professor and chair of the department of mechanical and aerospace engineering at the University of California–Davis. He also heads the California Wind Energy Collaborative, a partnership between the University of California and the California Energy Commission. He previously was employed as a National Research Council (NRC) post-doctoral researcher at the NASA Langley Research Center, a research engineer at Vigyan Research Associates in Hampton, Virginia, and joined UC Davis in 1985. Van Dam's current research includes wind energy engineering, aerodynamic drag prediction and reduction, high-lift aerodynamics and active control of aerodynamic loads. He has extensive experience in computational aerodynamics, wind-tunnel experimentation and flight testing; teaches industry short courses on aircraft aerodynamic performance and wind energy; has consulted for aircraft, wind energy and sailing yacht manufacturers; and has served on review committees for various government agencies and research organizations. He is a past recipient of the AIAA Lawrence Sperry Award, a U.S. Department of Energy Award and several NASA awards. Van Dam received a B.S. and M.S. from the Delft University of Technology, The Netherlands, and M.S. and Doctor of Engineering degrees from the University of Kansas, all in aerospace engineering.

Paul Vijgen

Aerodynamic Design Improvement: High-Lift and Cruise, p. 14

Paul Vijgen is an Associate Technical Fellow in aerodynamics engineering at Boeing Commercial Airplanes in Seattle. He currently supports the aerodynamic development of commercial aircraft (including 787 family), focusing on aerodynamic fuel-burn reduction technologies. Starting at NASA Langley in 1985, he has been involved with application studies and flight tests of laminar flow and other drag-reduction methods to wings, fuselages and nacelles. Other flight research activities include transport high-lift flows, wake-vortex development and supersonic turbulent flows. Vijgen received an M.S. from the Delft University of Technology, The Netherlands, and a Ph.D. from the University of Kansas, both in aerospace engineering.

Ken Vranish

Airborne Equipment Design and RTCA DO-160, p. 17

Ken Vranish is an independent consultant and president of KVA Engineering, Inc. He has 30 years of experience in the hardware and software design and certification of avionics equipment and other safety critical systems used on commercial and military aircraft. Vranish worked for 10 years at The Boeing Company in the development of autopilot systems. In 1987, he started his own consulting company and in the years since has worked on many aircraft systems, participated in aircraft incident reviews and conducted research with various industry groups on specialized topics pertaining to aircraft operation including the effects of atmospheric radiation on electronic components. Vranish is considered an industry expert on how radiation impacts the aircraft operational environment. Vranish holds a B.S. in electrical engineering from Montana State University in Bozeman.

Michael Wallace

Process-Based Management in Aerospace: Defining, Improving and Sustaining Processes, p. 49

Michael Wallace is an aerospace process management consultant with specializations in knowledge-based engineering and lean manufacturing and information technology. During his 26-year career in varied managerial capacities with The Boeing Company, Wallace led the design and implementation of quality improvement techniques including process-based management, knowledge-based engineering and quality management in several in-house processes. As a project manager with The Boeing Company, he was instrumental in introducing process management in factory and office environs and defining and leading process improvement projects that encompassed enhancements in lean manufacturing and information technology. Since retiring from The Boeing Company, Wallace is a frequent presenter on process-based management, along with other related topics such as project management, lean manufacturing and system analysis. He was a Baldrige Examiner with the Kansas Award for Excellence and a board member of the Kansas Center for Performance Excellence. Wallace has an M.B.A. from Wichita State University with extensive study in business and constitutional law and a B.S. in mathematics from the University of Kansas.

Donald T. Ward

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Flight Test Principles and Practices, p. 39

Donald T. Ward is a professor emeritus of aerospace engineering at Texas A&M University and a former director of its Flight Mechanics Laboratory. Previously, he served 23 years as an officer in the United States Air Force, retiring as a colonel. His last military assignment was as Wing Commander of the 4950th Test Wing at Wright-Patterson Air Force Base. Earlier tours included Commandant of the USAF Test Pilot School and Director of the F-15 Joint Test Force at Edwards Air Force Base. A Fellow of the AIAA, Ward is the senior co-author of two textbooks, *Introduction to Flight Test Engineering, Volumes I and II*. He is a member of the Society of Flight Test Engineers and the Society of Experimental Test Pilots. Ward holds a B.S. in aeronautical engineering from the University of Texas, an M.S. in astronautics from the Air Force Institute of Technology and a Ph.D. in aerospace engineering from Mississippi State University.

Kyle K. Wetzel

Certification Engineering of Utility-Scale Wind Turbines, p. 28

Kyle K. Wetzel is a wind turbine consultant and the president and CEO of Wetzel Engineering, Inc. He has engineered both utility-scale and small wind turbine systems for energy, aerospace and the defense industry since 1993 as a consultant and researcher through two of his own companies, as an engineering manager at Enron Wind Energy (now part of GE Energy), as executive vice president of Aerotech Engineering & Research Corporation and as a university researcher. Wetzel has served as principal investigator, project manager, and/or technical manager on government-funded R&D

contracts and has consulted for a number of large and small companies and has supported engineering of other turbine components. He has also served as an adjunct professor in the department of aerospace engineering at the University of Kansas. He was a member of the Peer Review Panel for Wind Energy Program, reviewing all wind energy technology projects funded by the Department of Energy. Wetzel holds an M.S. in aeronautical and astronautical engineering from the University of Illinois, and a Ph.D. in aerospace engineering from the University of Kansas.

Mark K. Wilson

Aerospace Applications of Systems Engineering, p. 16

Mark K. Wilson, president of Mark Wilson Consulting, is a systems engineering and aerospace consultant with more than 44 years of systems engineering acquisition experience. He is a founding director and chief operating officer of Aerospace Technologies Associates, LLC, and an associate with Dayton Aerospace, Inc. Wilson, a member of the senior executive service, completed his Air Force career as director of the Air Force Center for Systems Engineering, Air Force Institute of Technology (AFIT), Wright Patterson Air Force Base, Ohio. He served as the technical advisor for systems engineering at the Aeronautical Systems Center and as technical director in the Headquarters of Air Force Material Command (AFMC), Directorate of Engineering and Technical Management. He was director of engineering in the C-17 System Program Office at the Aeronautical Systems Center, where he directed all aspects of systems engineering necessary to develop, produce and sustain the C-17 Weapon System. He also worked on numerous weapon systems including the B-2 bomber and the F-15 fighter. Wilson earned his B.S. in aerospace engineering from Purdue University. He is a Sloan Fellow and holds an M.S. in management from Stanford University and an M.S. in management science from the University of Dayton.

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