International Council on Systems Engineering
Delaware Valley Chapter Meeting

Life Cycle Cost (LCC): An Enhancement to its Utility

Speaker 1: Robert S. Bruff
Lead Systems Engineer
The Boeing Company
Ridley Park, PA

Military/Civil Aircraft Systems Certification - Lessons Learned

Speaker 2: Leslie Alford
Technical Fellow
The Boeing Company
Ridley Park, PA

Date: Tuesday, October 24, 2006

Time: 5:30 p.m. $10 for attendees

Place: Boeing, Building 3-04
Philadelphia Site, Rotorcraft Division, Integrated Defense Systems (IDS)

Agenda:

5:30 to 6:00 Arrival and Introductions

6:00 to 6:30: Buffet Meal

6:30 to 6:45: Chapter Business

6:45 to 7:30: Speaker 1

7:30 to 7:40: Break

7:40 to 8:25: Speaker 2

8:25 to 8:30: Wrap Up

To RSVP:
By close of business (COB) October 16, 2006, you must contact Stan Stanilka at stanley.p.stanilka@boeing.com (phone 610-591-8080) and give your name, country of origin and contact information. For U.S. citizens, photo identification in the form of a valid driver's license must be presented to the Boeing Security Guard upon entering the Boeing facility. Foreign nationals must have a valid passport for display at time of visit. Green card holders must have their green card with them for admittance. All non-U.S. citizens are required to provide the following information to Stan Stanilka; full name, date of birth, place of birth, passport and/or visa #, country of citizenship, dual citizenship country (if

applicable), company of affiliation within the Delaware Valley region and/or within the U.S., member of INCOSE (yes/no), email address and phone contact information.

Directions to Boeing, Ridley Park, PA

Boeing may be accessed from I-95. From I-95S, exit at Ridley Park (Exit 8) and make a left onto Stewart Ave. From I-95N exit at Ridley Park (Exit 8) and make a right onto Stewart Ave. Take Stewart Ave. to Route 291. Make a right on to Route 291. At the next traffic light, make a right into the facility. Parking is located on your left (Lot 6), prior to the guard house (adjacent Building 3-28). Each attendee will be provided with a badge at the guard house and will be escorted to Building 3-04. Visitors must wear closed toe and heel shoes and be escorted at all times. An escort will meet you at the security guard house after you check in with the guard.

For further information about the International Council on Systems Engineering, please see:

- The INCOSE website at http://www.incose.org/ and
- The Delaware Valley Chapter web site at http://www.incose.org/delvalley/

Speaker Biographies

Robert S. Bruff

Mr. Bruff is currently lead systems engineer for the CV-22 tilt rotor program in Philadelphia. He has worked 40+ years in the aerospace industry holding a number of positions on both large and small programs for such companies as Westinghouse and Litton. He holds a BS in Engineering Science from Johns Hopkins University, and MBA from Loyola Baltimore, a MS Systems Engineering from the University of Missouri Rolla (UMR), and is currently pursuing a Ph. D. in Systems Engineering from Walden University. Mr. Bruff has retired from the Navy Reserve with over 30 years service, where he served most recently as Executive Officer for a NAVAIR unit. He resides in Westminster, MD, with his wife Mary.

Leslie Alford

Ms. Alford is a Technical Fellow at the Boeing Company, in the Rotorcraft Division of Boeing Integrated Defense Systems. She has been working in the field of software engineering since 1978, software certification since 1984, and avionics system engineering since 1997. She was a Software Designated Engineering Representative for the FAA from 1988 to 2003 and now specializes in military certifications. She has been involved with technical program management and software engineering analysis at Boeing and at suppliers on most airplane systems, particularly those that are flight critical. Leslie has been an active participant on RTCA subcommittees including SC167, SC190, and SC205 for the development and update of DO-178B. Military programs she's supported include JSF, C17, V-22, Apache, and Chinook programs in Boeing. She obtained her Masters in Software Engineering in 1983, and her undergraduate degree, a BA in English Education, cum laude, in 1972, both from Seattle University.

Abstracts

Life Cycle Cost (LCC): An Enhancement to its Utility.

Increasingly customer and contractor alike are becoming sensitized to shrinking budgets. In order to address this growing concern firms have been responding in innovative ways to create value. Yet too many systems have still been planned, designed, produced, and operated with little concern for economic issues and the total cost of the system over their intended life cycle. This total cost of the system is defined as life cycle cost (LCC). Although the technical factors of the design are usually adequately addressed, the economic factors are still often neglected; and, in instances where costs have been introduced, they have been too often viewed in a fragmented manner. The costs associated with activities such as research, design, testing, production or construction, system use and support, and material disposal have been isolated and addressed independently at various stages in the life cycle; however, they have not consistently been viewed in the necessary integrated way.

This paper addresses cost and economic factors under the general theme of design for affordability. An introduction to LCC is followed by a focus on costs as they occur throughout the system life cycle. The classically preferred LCC analysis methodology is described followed by the applications and benefits of LCC. However, even if one agrees to the value of a classic LCC analysis up front, the technique is too impractical for a number of reasons. Primarily, the values of terms used to generate LCC early in a program are too often difficult or impossible to accurately determine.

In an attempt to address this shortfall, a Boeing software tool that bounds the design of a rotorcraft, including all constraints, yet allows for sensitivity studies towards delivering an optimized LCC design was developed. This Conceptual Design Analysis of Alternatives (CDAoA) integrated tool suite provides rapid exploration over a broad design space without the usual encumbrances and delay of manual data handing between analyses and disciplines. This tool provides rapid evaluation of research, development, test, and evaluation (RDT&E), production, and operating costs associated with each parametric evaluation, sensitivity study, or evaluation. A second Boeing software tool that integrates the contrasting methodologies used in commercial and military aviation for determining productivity, effectiveness, and value is often used in conjunction with CDAoA. With this second tool, an analyst can quickly assess the impacts of cost, performance, reliability, availability, and survivability to a platform's value and productivity. In addition, an analyst can compare the value of different platforms across a spectrum of missions based on platform performance parameters.

Military/Civil Aircraft Systems Certification - Lessons Learned

There are lessons learned through comparing airworthiness criteria for military certified aircraft against commercial aircraft certification driven by civilian standards. This presentation discusses "Military/Civil Lessons Learned" with focus on differences between Military/Civil certification elements that include; Caution Warning, Lifecycle Lessons, Military-only Functionality, Multi-Mission, Legacy Systems and DER Roles.