



# NEWSLETTER

Vol. 6: Issue No. 6

August 2008



2002, 2004-07

*Please remember to renew your 2008 INCOSE membership — Memberships lapse in August!*



## UPCOMING EVENTS

### August Speaker Meeting Balancing Cost, Performance, Schedule, and Risk

#### Concepts and Analysis of Many Programs

##### Particulars

SPEAKER: Dr. Edmund H. Conrow, Ph.D.

WHEN: August 19, 2008, 5:30 p.m. to 8:30 p.m.

WHERE: National University

Remote sites will be available via webcast

COST: Members: free, non-members: \$10

RSVP by August 15

See page 3 for more information

For registration and more information go to:

[www.incose-la.org](http://www.incose-la.org)

*Work is underway to provide tutorials, speaker meetings, and dinner meetings for the members of the Los Angeles Chapter of INCOSE*

## Future Events

### September speaker meeting and December dinner meeting in work!

### The 2009 Mini-Conference Unique to the INCOSE-LA Chapter

Presentations and forums of interest to the systems engineering community

SPEAKERS: In work

WHEN: February 7, 2009

WHERE: Loyola Marymount University

*Check future editions of the Newsletter, watch your email for messages from the INCOSE-LA Reflector, and check the INCOSE-LA website [www.incose-la.org](http://www.incose-la.org) for up-to-the-minute details!*

## “Causes of Error” (or Root Cause Analysis Before We Invented RCA)

An Analysis by Roger Bacon  
(from his *Opus Majus* written in 1267)

“Now there are four chief obstacles in grasping truth, which hinder every man, however learned, and scarcely allow any one to win a clear title to learning, namely:

1. *submission to faulty and unworthy authority,*
2. *influence of custom,*
3. *popular prejudice, and*
4. *concealment of our own ignorance accompanied by an ostentatious display of our knowledge.*

Every man is entangled in these difficulties, every rank is beset. For people without distinction draw the same conclusion from three arguments, than which none could be worse, namely for this the authority of our predecessors is adduced, this is the custom, this is the common belief; hence correct. But an opposite conclusion and a far better one should be drawn from the premises, as I shall abundantly show by authority, experience, and reason. Should, however, these three errors be refuted by the convincing force of reason, the fourth is always ready and on everyman's lips for the excuse of his own ignorance, and although he has no knowledge worthy of the name, he may yet shamelessly magnify it, so that at least to the wretched satisfaction of his own folly he suppresses and evades the truth. Moreover, from these deadly banes come all the evils of the human race; for the most useful, the greatest, and the most beautiful lessons of knowledge, as well as the secrets of science and art, are unknown. But, still worse, men blinded in the fog of these four errors do not perceive their own ignorance, but with every precaution cloak and defend it so as not to find a remedy; and worst of all, although they are in the densest shadows of error, they think that they are in the full light of truth. For these reasons they reckon that truths most firmly established are at the extreme limits of falsehood, that our greatest blessings are of no moment, and our chief interests possess neither weight nor value. On the contrary, they proclaim what is most false, praise what is worst, extol what is most vile, blind to every gleam of wisdom and scorning what they can obtain with great ease. In the excess of their folly they expend their utmost efforts, consume much time, pour our large expenditures on matters of little or no use and of no merit in the judgment of a wise man. Hence it is necessary that the violence and banefulness of these four causes of all evils should be recognized in the beginning and

Continued on page 2

## Causes of Error... and a proactive strategy

*(continued from page 1)*

*"I would regard it as the greatest treachery on my part if, in embarking on a new domain of knowledge, I accepted any foregone conclusions."*  
— Niels Bohr

rebuked and banished far from the consideration of science. For where these three bear sway, no reason influences, no right decides, no law binds, religion has no place, nature's mandate fails, the complexion of things is changed, their order is confounded, vice prevails, virtue is extinguished, falsehood reigns, truth is

hissed off the scene. Therefore, nothing is more necessary of consideration than the positive condemnation of those four errors through the chosen arguments of wise men which shall prove irrefutable."

*"Successful programs are out there to win. Unsuccessful programs are out there to keep from failing."*  
— An astute program manager

As noted in the technical paper "Principles of Flight Test," (AIAA-86-9742):

"In thirteenth-century England, Roger Bacon addressed the causes of error [the analysis above]. Although his four causes of error were written in response to a commission from Pope Clement IV rather than to meet the needs of twentieth-century flight test, his points are applicable."

Independent of the original Latin and its 1928 translation\* into what may now seem to be stilted or archaic English, Bacon's analysis transcends time and technology. Like the systems engineering process, the fundamentals are timeless. The failure of a product is a consequence of the creation of the product as opposed to something intrinsic in the product itself. "Modern" has seen the taming of steam and electricity and the invention of computers (circa 1890's!), but the maxims are the same. All successful projects follow the systems engineering process. Some follow it deliberately. The others follow it eventually. Similarly, failures can be traced, ultimately and in keeping with an attribute of a fundamental truth, to the four root causes identified by Bacon. The intervening advances in technology have changed neither the basics deduced by Bacon or the fundamentals of systems engineering.

*Failure to follow the procedure, no matter how irrelevant to the incident, is grounds for crucifixion before a board of inquiry.*

\*The translation from the Latin is by Robert Belle Burke according to *Moments of Discovery, Volume I, The Origins of Science* by George Schwartz and Phillip W. Bishop, 1958, Basic Books Inc.

Do you have any experiences that complement Bacon's analysis that you can share?  
Do you have any comments, pro or con?  
Please send your experiences and comments to the Newsletter editors, Edie Ung ( [edie@raytheon.com](mailto:edie@raytheon.com) ) and Jorg Largent ( [Palmdalejorg@aol.com](mailto:Palmdalejorg@aol.com) ).

### The Board of Directors wishes to welcome the following new members in the Los Angeles Chapter of INCOSE:

Note: The information listed below is from the member directory and is based upon your initial membership application. If the information is not correct or complete, then please access the member directory (at [www.incose.org](http://www.incose.org)) to update your information.

Name	Title	Company
Mahyar Amouzegar	Dean, College of Engineering	California State University, Long Beach
Jackie Grabarsky	Student	Northrop Grumman Company
Travis Willcox	Student	Naval Postgraduate School
Michael Schupbach	Student	Naval Postgraduate School
Steven Roycroft	Student	Naval Postgraduate School
Wellington Phillips	Student	Naval Postgraduate School
Wilhelm Perez	Student	Naval Postgraduate School
Luis Martinez	Student	Naval Postgraduate School
Mark Hadley	Student	Naval Postgraduate School
Benjamin Forest	Student	Naval Postgraduate School
Carrey Chin	Student	Naval Postgraduate School
Donald Farra	Senior Space Vehicle Systems Engineer	Northrop Grumman Space Technology
Olivia Zhao	Clinical Systems Engineer	St. Jude Medical
John Michaylo	Director, Engineering	

## Balancing Cost, Performance, Schedule, and Risk Concepts and Analysis of Many Programs

August 19, 2008

Presented by Dr. Edmund H. Conrow, Ph.D.  
CMC, CPCM, CRM, PMP



wide variety of programs and proposals. He has also served numerous times as a manager and consultant (to the CEO-level) in the areas of communications, cost, human resources, integration, quality, schedule, team building, and scope.

Dr. Conrow is a Certified Management Consultant (IMC), Certified Professional Consultant to Management (NBCC), Certified in Risk Management (IIPCEC) and a Project Management Professional (PMP). Dr. Conrow is an AIAA Associate Fellow and Life Member, IEEE Senior Member, and INCOSE member. Dr. Conrow is the author of the book: *Effective Risk Management: Some Keys to Success*, Second Edition, (AIAA, 2003), author of the risk management chapter in Harold Kerzner's best selling book, *Project Management: A Systems Approach to Planning, Scheduling, and Controlling*, Seventh through Ninth Editions (2006, Wiley); author of the risk management chapter in Harold Kerzner's *Advanced Project Management: Best Practices on Implementation*, Second Edition, (Wiley, 2003), and author or co-author of numerous government risk management publications and risk management portions of other publications. He holds a B.S.N.E. and M.S. (nuclear engineering) from the University of Arizona, Ph.D. (general engineering) from Oklahoma State University, and M.Phil. and Ph.D. (policy analysis) from the RAND Graduate School.

Dr. Conrow presents an analytical framework he developed that examines typical DoD and NASA development, and can also be applied to non-aerospace and purely commercial programs. Five specific hypotheses were developed from the framework which suggest DoD and NASA development program outcomes. Dr. Conrow tested and proved correct all five hypotheses when examined against actual data from more than 50 large-scale development programs. These hypotheses and a summary of the actual program results will be discussed. Dr. Conrow will also provide several recommendations that can alleviate cost, performance, schedule, and risk problems on a wide variety of programs by addressing the underlying causes mentioned above.

**WHEN:** Tuesday, August 19, 2008, 5:30—8:30 p.m.

### MEETING AGENDA

5:30 Networking

6:20 Speaker Introduction

6:30 Presentation

7:30 Open-ended Discussion

**RSVP by August 15:** For those attending at the host site, it is requested that you RSVP so that we can plan adequate refreshments.

RSVP online at [www.incose-la.org](http://www.incose-la.org)

RSVP by email to [registration@incose-la.org](mailto:registration@incose-la.org) (please include "INCOSE-LA August Mtg" in subject line)

**COST:** Members: FREE; Non-members: Suggested donation of \$10.00. Light refreshments will be provided.

**WHERE:** National University, 5245 Pacific Concourse Drive.

That is near LAX and just southwest of the 405/105 interchange.

**DIRECTIONS:** Coming from the south on the 405, exit at El Segundo, turn left, go under the freeway and then take an immediate right on to La Cienega. Go north about three quarters of a mile and turn left on to Pacific Concourse.

Coming from the north on the 405 follow the signs for the exit to Imperial Highway, staying on the off ramp underneath the 105. The off ramp dumps on to La Cienega. Turn left on to La Cienega, go south about 100 yards and turn right on to Pacific Concourse.

Coming from the east on the 105 exit on to Hawthorne, turn left and go south over the freeway to Imperial Highway. Turn right on to Imperial and go west a little over a mile, passing under the 405/105 interchange, and turn left on to La Cienega. Go south on La Cienega about a third of a mile.

**Abstract:** It is not uncommon for DoD and NASA programs to have moderate to substantial cost growth and schedule slippage while meeting many desired performance parameters. While these concerns have been known for 50 years, they still exist today despite a variety of efforts to curtail them. Key underlying causes are the inability to trade cost, performance, schedule, and risk in an unbiased fashion by the government and contractor participants, coupled with an often infeasible program starting point, and lack of knowledge of utility preferences and feasible limits that will affect the resulting design. By the time these items are understood to a first order, the ability to use this knowledge has been foreclosed and key program and design decisions have long since been made. (It is interesting to note that neither systems engineering nor project management professional societies nor government publications adequately address these concerns, but rather touch on the resulting problems) Dr. Conrow presents an analytical framework he developed that examines typical DoD and NASA development, and can also be applied to non-aerospace and purely commercial programs. Five specific hypotheses were developed from the framework which suggest DoD and NASA development program outcomes. Dr. Conrow tested and proved correct all five hypotheses when examined against actual data from more than 50 large-scale development programs. These hypotheses and a summary of the actual program results will be discussed. Dr. Conrow will also provide several recommendations that can alleviate cost, performance, schedule, and risk problems on a wide variety of programs by addressing the underlying causes mentioned above.

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Come to this meeting for an overview of the underlying causes that lead to adverse development program cost, schedule, performance, and risk outcomes; an evaluation of hypotheses derived from the framework compared to more than 50 actual large-scale programs; and a discussion of recommendations that can potentially alleviate the resulting cost, performance, schedule, and risk concerns.

*Want to learn about causes for program cost growth and schedule slippage and recommended solutions? Come to the August 19 speaker meeting*

Come to this meeting for an overview of the underlying causes that lead to adverse development program cost, schedule, performance, and risk outcomes; an evaluation of hypotheses derived from the framework compared to more than 50 actual large-scale programs; and a discussion of recommendations that can potentially alleviate the resulting cost, performance, schedule, and risk concerns.

**Biography:** Dr. Conrow has 30+ years of risk and project management, and technical experience supporting industry and government. He helps clients reduce project risk and uncertainty, and better develop and deliver products within budget, on time, and meeting performance requirements. Dr. Conrow is a nationally recognized expert and helped to develop risk management policy that is in widespread use across industry, government, and professional organizations. He has served more than 25 times as a risk manager and mentor to risk managers on a

INCOSE LA Chapter

Vol. 6: Issue No. 6

NEWSLETTER

August 2008

## A thought provoking article from our president, David Boyd, and thoughts in response from Jorg Largent

David Boyd, INCOSE-LA President, emailed an article from the *New York Times*, which, in an abridged form (hammer to fit), is below:

The generation of engineers responsible for many of the most successful military projects is aging, and fewer of the nation's top young engineers are replacing them. Instead, they are joining high-tech companies and other civilian firms that provide not just better pay than the military or its contractors, but also greater cachet — what one former defense industry engineer called “geek credit.”

One measure of this shift can be found at the Air Force where the number of engineers on the Air Force's core acquisition staff has fallen 35% to 40% over the last 14 years.

At a recent hearing of the Senate Armed Services Committee, Senator Carl Levin said cost overruns on military projects had “reached crisis proportions.” He called for the creation of an internal Pentagon office to oversee costs. A recent GAO study of military projects worth \$1.6 trillion reported projected cost overruns totaling \$295 billion, or 40%, and an average delay of 21 months. A prime culprit was often deficient engineering management.

*Proselytize for better engineering management or better systems engineering?*

A task force is visiting university campuses and military contractors to proselytize for better engineering management. As these experts explain it, the central problem is a breakdown in the most basic element of a project: accurately assessing at the outset whether the technological goals are attainable and affordable, then managing the engineering to ensure that hardware and software are properly designed, tested, and integrated.

The technical term for the discipline is systems engineering. In recent years, the Pentagon has transferred more and more oversight responsibility to its contractors, who themselves often lack sufficient systems-engineering skill.

At M.I.T., a 2007 survey showed that 28.7% of undergraduates were headed for work in finance, 13.7% in management consulting, and just 7.5% in aerospace and defense. The survey showed that the average annual starting salary in finance and high-tech was more than \$70,000, compared with \$37,000 at the Defense Department. The average in the military industry was \$61,000.

Stuart V. Kerr, a software developer with advanced degrees in mathematics and electrical engineering, left the defense industry after ten years for a high-tech company. Mr. Kerr said the protracted development time for military projects “amounts to a professional death sentence” for scientists and engineers who want to keep up with technological advances. Mr. Kerr said young engineers were also put off by the multilayer bureaucracies associated with military projects.

### THOUGHTS IN RESPONSE

The article raises some observations and interesting questions in the mind of one graybeard, your editor:

The word “crisis” has been used before. In 1987, Grady Brooch wrote about the “software crisis;” the software crisis of the 1980's being a basis for CMM. CMM morphed into CMMi, but the statistics from 1987 and 2007 would suggest that the addition of more models and metrics to measure the maturity of an organization and the imposition of architectural frameworks has not improved our performance as an industry or as a profession. These changes may proffer understanding the “professional death sentence” quote attributed to Mr. Kerr and the source of the multilayer bureaucracies that alienate young engineers.

*Another metric won't help if management won't listen to that one either.*

A prime culprit is deficient engineering management. Many agree, but more help from headquarters is not the answer.

Proselytizing for better engineering management is a good thing, but it is not to be confused with the much-needed proselytizing for understanding the systems engineering process.

Some suggestions:

**1. Treat the old guys right.** Make it worthwhile to stay. Provide the tools needed to work modern technology. “Tools needed” are tools, typically software, that facilitate getting the job done as opposed to tools that are long on bells and whistles that do little more than billboard the geekiness of the programmers. How many veteran engineers retire because the pay is no longer worth it and the tool-du-jour monkey motion is not worth the bother?

**2. Treat the potential college graduates right.** Money speaks. Most students who are smart enough to do the math in an engineering curriculum are also smart enough to do the math and to seek a more rewarding career path with less hassle. On top of that you can add the cost of living in California and other traditional centers of engineering, and it becomes intuitively obvious as to why the interest in aerospace is waning.

**3. Don't kid yourself about #1 and #2.** If senior engineers are leaving and college graduates are not applying, the investment in shake-and-take consultants was a waste or was not applied.

*“All science is either physics or stamp collecting.”*  
—Lord Kelvin

## INCOSE-LA Mini-Conference 2009 Call for Volunteers Eric Belle, Chapter Vice-President

Planning is now underway for the 2009 INCOSE-LA Mini-Conference to be held at Loyola Marymount University in Los Angeles February 7, 2009. INCOSE-LA traditionally holds a one-day mini-conference every other year, with a focus on an interesting systems engineering topic (currently in work).

We are currently seeking volunteers who wish to be a part of the organizing committee. There are a wide range of positions that we are seeking to fill with enthusiastic members who are motivated to increase their disciplinary skills while broadening their industry network. Interested parties are encouraged to contact Eric Belle, the INCOSE-LA vice-president, at [eric\\_c\\_belle@raytheon.com](mailto:eric_c_belle@raytheon.com).

***A FREE introductory two-day course in  
Fundamentals of System Engineering  
will be offered under the  
Department of Labor/WIRED Initiative***

The course has been developed jointly by The Aerospace Corporation and California Polytechnic University San Luis Obispo and will be given on the beautiful CalPoly SLO campus on September 9 and 10, 2008.

The course objectives are to:

- ***Improve awareness of SE relevancy to business goals and industry norms***
- ***Improve understanding of SE practice, processes, and objectives***
- ***Increase awareness of SE roles and responsibilities***
- ***Identify targets for more in-depth learning opportunities***

You will hear from educators and practitioners as they address a wide spectrum of system engineering topics at various levels of breadth and depth, including:

- ***Introduction to Systems Engineering***
- ***Project Management***
- ***Risk Management***
- ***Mission & Requirements Development***
- ***Synthesis, Verification, and Testing***
- ***Manufacturability, Reliability, Availability, Maintainability***
- ***Human Factors***
- ***Decision Making / Trade Studies***
- ***Interface Management / Configuration Management***
- ***Design of Experiments***
- ***Simulation and Optimization***

There will also be panel discussions and a reception to meet providers of follow-on educational opportunities. The course is open to degreed engineers who:

- ***Are currently employed***
- ***Have a need to know more about systems engineering***
- ***Have intentions of pursuing systems engineering training or education***

Pre-registration is required. For more information and registration contact:

Joel Shrater at 310.336.7755 or  
Michelle Bell at 310.336.2832

*Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative*

**INCOSE LA Chapter**

**Vol. 6: Issue No. 6**

**NEWSLETTER**

**August 2008**

# INCOSE LA Chapter NEWSLETTER

Vol. 6: Issue No. 6 August 2008

Return Address:

800 S. Pacific Coast Hwy. #8-205  
Redondo Beach, CA 90277

## Forwarding Address Requested

The International Council on Systems Engineering (INCOSE) is an organization formed for the purpose of advancing the art and science of systems engineering in various areas of the public and private sectors. The Los Angeles Chapter meets several times per year for dinner meetings, and additionally sponsors tutorials and other activities of interest to those in the systems engineering field or related fields. L. A. Chapter Officers are as follows:

### 2008 Board of Directors and Appointed Positions

#### Elected Officers

<b>President:</b>	John David Boyd	john.boyd@incose.org	or	president@incose-la.org
<b>Vice-President:</b>	Eric Belle	eric_c_belle@raytheon.com	or	vicepresident@incose-la.org
<b>Past President:</b>	James Manson III	james.manson@incose.org	or	pastpresident@incose-la.org
<b>Secretary:</b>	Beth O'Donnell	elizabeth.l.o'donnell@boeing.com	or	secretary@incose-la.org
<b>Treasurer:</b>	Marsha Weiskopf	marsha.weiskopf@aero.org	or	treasurer@incose-la.org

#### Elected At-Large Directors

<b>Membership:</b>	Paul Cudney	paul.cudney@incose.org	or	membership@incose-la.org
<b>Programs/Speakers:</b>	Jack Elson	jelson@nu.edu	or	programs@incose-la.org
<b>Tutorials/Education:</b>	Shirley Tseng	shirleytseng@earthlink.net	or	setraining@incose-la.org
<b>Ways and Means:</b>	Dana Pugh	dana.pugh@incose.org	or	waysandmeans@incose-la.org
<b>Communications:</b>	Lee-Ann Seeling	lsseeling@aol.com	or	communications@incose-la.org

#### Appointed Positions

<b>Newsletter co-editors:</b>	Edie Ung, Jorg Largent	edie@raytheon.com	or	Palmdalejorg@aol.com
<b>Newsletter Production Manager:</b>	Communications Director			
<b>Reflector Manager:</b>	Susan Ruth	susan.c.ruth@aero.org		
<b>Industrial Relations Manager:</b>	Jose Garcia, Jr.	jose.s.garcia-jr@boeing.com		
<b>Technical Society Liaison:</b>	Edmund Conrow	info@risk-services.com		
<b>Chapter Recognition Manager:</b>	Michael Maar	michael.c.maar@boeing.com		
<b>Lead Site Coordinator:</b>	Anna Warner	anna.warner@boeing.com		
<b>Webcast Event Manager:</b>	Chris Delp	clldelp@jpl.nasa.gov		
<b>Website Content Manager:</b>	Communications Director			
<b>Website Technical Manager:</b>	Benjamin Luong	Benjamin.Q.Luong@boeing.com		
<b>CSER 2008 Management Chair:</b>	Malina Hills	malina.m.hills@aero.org		
<b>CSER 2008 Continuity Chair:</b>	Scott Jackson	jackessone@cox.net		
<b>Venue Chair:</b>	Denise Nelson	Denise.J.Nelson@boeing.com		
<b>Representative to San Fernando Valley Engineers' Council:</b>	Stephen Guine	Stephen.Guine@ngc.com		

Those interested in INCOSE membership please contact Paul Cudney - [paul.cudney@incose.org](mailto:paul.cudney@incose.org). If you wish to be placed on our E-mail distribution, please contact Susan Ruth - [susan.c.ruth@aero.org](mailto:susan.c.ruth@aero.org).