
The Role of Systems Engineering in Combating FUTURE Acts of Terrorism

**Dr. William F. Mackey, Facilitator
Anti-Terrorism International WG**

**Tuesday, July 1, 2003
INCOSE 13th Annual International Symposium
Washington, D.C.**



Major Terrorism Attacks During the Past Year

- α Sep. 2002 – Many Australian citizens lost their lives or were severely injured while vacationing in Bali, Indonesia**
- α Oct. 2002 – Ten persons were killed and three severely injured by snipers attacks in the Washington metropolitan area**
- α Mar. 2003 – The war in Iraq commences with significant American, British, Australian and Iraqi loss of life and injury to prevent future acts of terrorism**
- α Apr. 2003 – Several Saudi Arabian and American lives were lost during terrorist attacks in Riyadh, Saudi Arabia**
- α May 2003 – Israeli and Palestinian lives are lost as a result of Hamas attempting to stop peace negotiations between Israel and a potential new Palestine state**





The Role of SE in Combating Future Acts of Terrorism: Panel Thesis and Origins of Terrorism

- q **Panel Thesis:** The multidisciplinary approach of systems engineering is useful in evaluating future terrorist threats, identifying existing system vulnerabilities, and reducing or eradicating international terrorism

- q **Definition and origins of Terrorism**
 - **Terrorism** is the systematic use of force and violence to create fear as a means of coercion.
 - It emerged as a concept in 1793-94 during the Reign of Terror in France
 - It has been used by dissident groups to violently intimidate a population or government into granting their demands.
 - The calculated murder of political personalities and military personnel to achieve political objectives has given way to the almost random killing of innocent people and civilian populations.

Introduction to the Panelists

- q **Dr. William Mackey – Sr. Member Exec. Staff, CSC
“INCOSE’s Response to the Events of September 11”**
- q **Dr. Harry Crisp – Director of Naval Collaborative
Engineering Environment, Dept. of the Navy
“Evolving Functional Architectures in Response to the
Terrorism Threat”**
- q **Dr. Bill Ewald – Psychologist, OCR Macro International,
“The Human Systems Side of Terrorism: The Business of
Paradigms”**
- q **Dr. Ralph Godau – RMIT University, Melbourne, Australia
“The Impact and Response of Australia to the Bali,
Indonesia Terrorist Attack”**

Introduction to the Panelists (cont'd)

- q **James Long – President, Vitech Corp.
“Applying Modeling and Simulation to Prediction and Analysis of Terrorist Activities”**
- q **The Honorable James Loy, Under Secretary of the Department of Homeland Security (retired Admiral and Commandant of the U.S. Coast Guard **(Moved to the Leadership Track on July 2)**)**

Issues Posed to the Panelists

- q **From the public agency perspective,**
 - How can a volunteer organization such as INCOSE provide relevant value to the public agency mission?
 - What needs to be done to existing systems to mitigate future terrorist threats?
 - How do public agencies integrate information sources?
 - What systems work within a public agency? Don't work? Need improvement

- q **From an industry and systems perspective,**
 - How can Systems Engineering be useful in preventing future terrorist events?
 - What systems need to be developed to support DHS?
 - What does legislation tell us about the requirements for such systems?
 - How will the SE&I industry respond to these needs?

“INCOSE’s Response to the Events of September 11”

**Dr. William F. Mackey
Computer Sciences Corp. and
University of Maryland University College**

**INCOSE Technical Board Chair
Anti-Terrorism International Working Group
Chair**

History of INCOSE Initiative

Initial Discussions of INCOSE Initiative

- Began in 1999 at SEATC Meetings
- Spurred by
 - Expand successes of SEATC
 - Desire to involve all TC's
 - Need to make a real difference
 - Need to retain and involve membership

SEATC Meetings at IW in Mesa, AZ (January 2001)

- Discussions reduced to presentation slides entitled “INCOSE Revitalization Project”
- Consideration given to addressing BOD

Events of September 11, 2001 acted as catalyst in bringing SEATC plans to fruition

Systems Engineering Initiatives Technical Committee (SEITC) Mission and Goals

- q **SEITC Mission:** Involve entire membership in the selection and creation of an INCOSE-wide product, which demonstrates the use of systems engineering principles, techniques, and practices to address a public interest challenge or a series of challenges that have potential international impact.

- q **SEITC Goals:**
 - Revitalize the INCOSE Technical Board and membership
 - Focus INCOSE's energy on issues of public service and need
 - Demonstrate the value of SE through its application to a public interest challenge
 - Increase the influence and prestige of INCOSE to the international community
 - Improve member retention and professional standing

Examples of Public Interest Challenges

- **Public Interest Challenge:** An unsolved problem that has negative effects on people of various cultures and geographical locations and that is amenable to the application of systems engineering
- Reduction and eradication of international terrorism
- Reduction of global warming
- Eradication of the AIDS epidemic
- Creation of an international energy policy
- Provision of international clean water supplies
- Reduction of air and water pollution
- Delivery of health care to disaster areas
- Expansion of international agriculture production
- Prevention of drug trafficking and abuse
- Provision of affordable housing

Anti-Terrorism International Working Group (ATIWG)

Mission and Structure

- q **ATIWG Mission:** Involve entire membership in the creation of INCOSE-wide products, which demonstrate the use of systems engineering principles, techniques, and practices to reduction and eradication of international terrorism

- q **ATIWG Structure:**
 - Steering Committee
 - J. Long, ATIWG Co-chair
 - W. Mackey, ATIWG Co-chair
 - H. Crisp
 - B. Ewald, BOD
 - A. Fairbairn, IEWG Cochair and UK Chapter
 - D. Cropley, INCOSE 2001 Tech Chair and SESA Member
 - Jas Madhur, INCOSE 1998 Symp Chair and Vancouver Chapter Member
 - P. Sweeney, SEITC Chair
 - Volunteer members of INCOSE

Current Status of INCOSE Efforts

- q **SEITC Status:**
 - Charter created Sept. 17, 2001
- q **ATIWG Status:**
 - Charter created Sept. 18, 2001
 - Steering Committee formed
- q **Anti-Terrorism System Models developed – behavioral, heirarchical, financial, N**2, functional flow, factors and tension (ontology) model**
- q **Anti-Terrorism Concept Exploration Document – written by U. of Maryland SE graduate students**
- q **ATIWG Meetings held in Mesa, AZ – Feb., '02; Las Vegas, NV – Aug., '02; Tampa, FL – Jan., '03**
- q **Partnerships suggested and being pursued**
- q **WMA Chapter is focused on issue – 2 or 3 meetings**

Current Status of INCOSE Efforts (cont'd)

q Two papers written:

- “The Role of Systems Engineering in Combating Terrorism”, (six authors in Las Vegas panel), INCOSE 13th Annual International Proceedings, Washington, D.C., July 2003
- “Systems Engineering Modeling Useful in Combating Terrorism”, Long, J. and Mackey, W., INCOSE 13th Annual International Proceedings, Washington, D.C., July 2003

q Two panels presented:

- “The Role of Systems Engineering in Combating Terrorism”, (eight persons on panel), INCOSE 12th Annual International Symposium, Las Vegas, NV, August 2002
- “The Role of Systems Engineering in Combating Future Acts of Terrorism”, (seven persons on panel), INCOSE 13th Annual International Symposium, Washington, DC, July 2003

What Can a Volunteer Engineering Organization Such as INCOSE Do?

- q Apply our expertise in open forums such as this panel to the terrorism issues facing the world**
- q Review and refine the Anti-Terrorism Concept Exploration document prepared by UMUC graduate students for publication by WG**

ATIWG Proposed Approach for Selecting Partnerships

- Step 1: Identify Customers and Stakeholders**
- Step 2: Develop Problem Statement**
- Step 3: Evaluate Issues**
- Step 4: Establish Criteria for Project Selection**
- Step 5: Identify SE Opportunities**
- Step 6: Evaluate Alternative Opportunities**
- Step 7: Select INCOSE Project(s)**

Step 4: Establish Criteria for Project Selection

The project should:

- q Have international applicability**
- q Be amenable to systems engineering**
- q Be of interest to the INCOSE membership**
- q Have a customer**
- q Add value and not duplicate existing efforts**
- q Be capable of being performed by volunteers**
- q Fit within the scope of the Working Group**
- q Be a well bounded problem**
- q Be unclassified, unrestricted, open and visible**

Step 5: Identify SE Partnership Opportunities

- q Partnership with the National Guard for Applying Systems Engineering Methods to Plan and Implement Emergency Preparedness in Local Communities**

- q Facilitate the Coordination Among Government and Civic Organizations in Their Planning to Prevent Terrorism**
 - Strategic Summit to Address How Systems Engineering Thinking, Principles, Methods, Tools Enhance the Success of “Homeland” Security Organizations Nationally and Internationally**
 - Brings together government, industry, academia under INCOSE umbrella (akin to AFCEA)**
 - Advances INCOSE strategic presence**
 - American Society of Naval Engineers – Workshop collaboration on “Maritime Aspects of Homeland Security”**
 - Coastal System Station , NSWCDD (FL)**
 - Protection of maritime assets**
 - Building a virtual port to test capabilities of “first responders”**

***Evolving Functional Architectures in Response to
the Terrorism Threat***

Dr. Harry E. Crisp
**Director, Naval Collaborative Engineering
Environment**
Office of the Chief Engineer
**Assistant Secretary of the Navy (Research,
Development and Acquisition)**

***“The Human Systems Side of Terrorism: The Business
of Paradigms”***

**Dr. Bill Ewald
Psychologist, OCR Macro International**

INCOSE Human Systems Working Group Chair

***The Impact and Response of Australia to the Bali,
Indonesia Terrorist Attack***

**Dr. Ralph Godau
RMIT University, Melbourne, Australia**

INCOSE SEATC CoChairman

The Bali Bombs

q **October 13, 2002**

- **Two bombs detonated in Kuta, Bali, in an area packed with hotels, restaurants and bars.**
- **202 people killed, including 88 Australians, many Balinese and other foreign nationals. Many more injured, especially with burns.**
- **The event caused a profound shock to Australians who have long seen Bali as a popular holiday destination.**



The Sari Club immediately after the bombs were detonated.



The next day

Searching for friends and relatives

Background

- q **Bali is a predominantly Hindu society embedded in Muslim Indonesia.**
- q **Australia's involvement in the UN-sanctioned independence of East Timor from Indonesia in 1999 caused diplomatic friction between Australia and Indonesia.**
- q **Two of the Bali suspects recently revealed that Australia's involvement in East Timor and military support of the US in Afghanistan made it a prime target for terrorist attack.**

Aftermath

- q Unlike the 9/11 situation there was no rapid and direct military option.
- q Australia's foreign intelligence service, ASIO, admitted recently that it did not have the information to prevent the attacks.
- q What has happened is:
 - Indonesia has adopted a much more aggressive stance against Islamic terrorism within its borders.

Aftermath

- q **ASIO attentions have now been focused on regional terrorism, especially the danger posed by Jemaah Islamiah (JI), the alleged sponsor of the Bali bombs.**
- q **Australia's political will was steeled and this has fuelled the continued strong support of the US, for example in Iraq, irrespective of any local political cost.**

Conclusion

- q **The recent declaration by Saudi Arabia is another step in the growing move by countries, especially Islamic countries, to firmly distance themselves from Islamic terrorism.**
- q **At what level; local, national, international, can Systems Engineering offer solutions to this 'soft systems' problem?**

Postscript

- q **“Tyranny, like hell, is not easily conquered; yet we have this consolation with us, that the harder the conflict, the more glorious the triumph. What we obtain too cheap, we esteem too lightly.”**
 - Thomas Paine, December 23, 1776.