2008 SEAC Initiatives

A-P-T Research, Inc.

2008 SEAC Initiatives to Improve Safety Engineering

Each year the Safety Engineering and Analysis Center (SEAC) sponsors or coordinates multiple activities to support Safety, Quality and Mission Assurance (SQ&MA) professionals.

This year the SEAC will focus on:

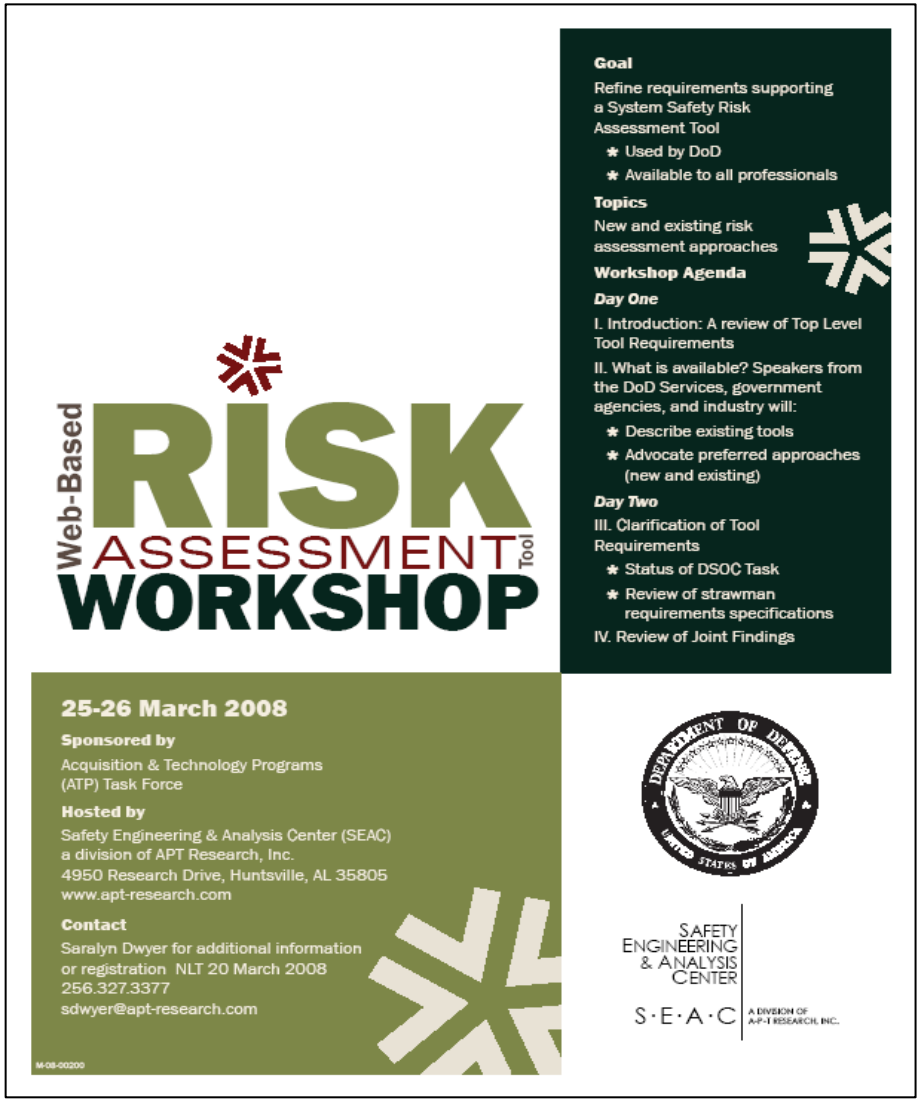
- Risk Assessment Tool
- System Safety Metrics Method
- Career Boarding Process
- Training
- Workshops

Risk Assessment Tool

A-P-T Research, Inc.

Development of a web-based software tool to be used by acquisition analysts to perform risk assessments. Designed for DoD programs.

- Sponsor: DoD Acquisition & Technology Programs (ATP) Task Force
- Goal: Refine Requirements supporting a System Safety Risk Assessment Tool
- Topics: New and existing risk assessment approaches
- Review of top level tool requirements
- Description of existing tools
- Clarification of tool requirements
- Participation from Services, Government Agencies, and Industry



System Safety Metrics Method

A-P-T Research, Inc.

28 August 2007

Final Report
System Safety Metrics Method

Doc. No. S-07-00400

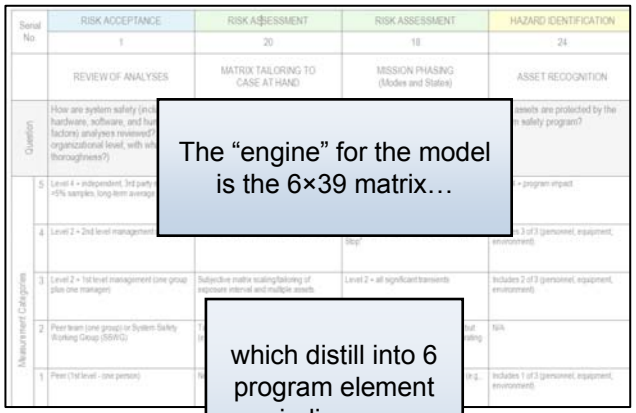
Prepared for:
Concurrent Technologies Corporation
1225 S. Clark Street, Suite 500
Arlington, VA 22202

Prepared by:
APT Research, Inc.
4950 Research Drive
Huntsville, Alabama USA 35805

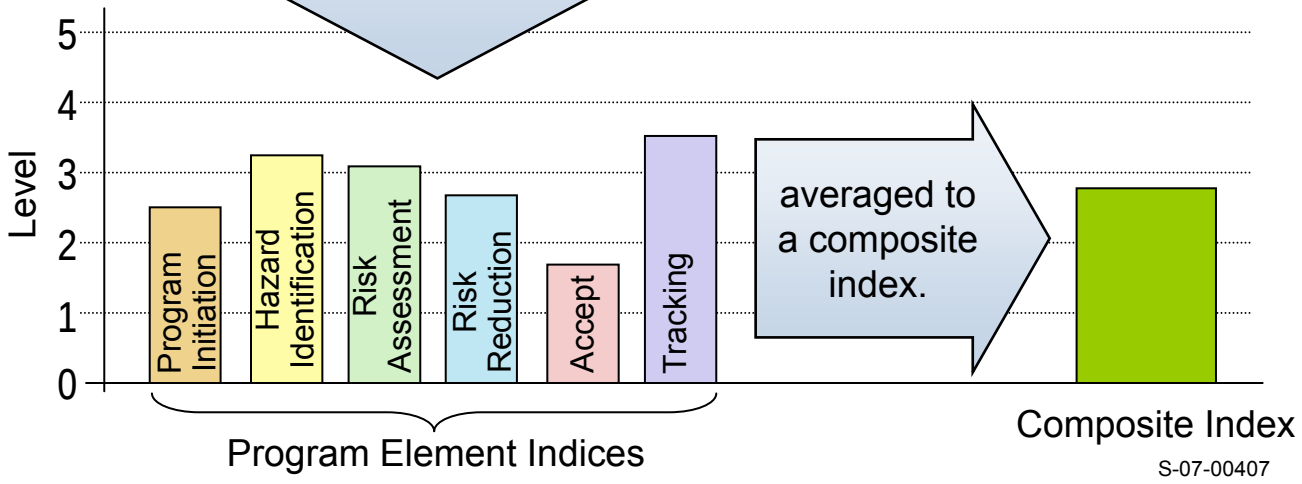
- Sponsored by the DoD Acquisition & Technology Programs (ATP) Task Force.
- The Safety Metrics Method is designed to assist the DoD in evaluating the system safety programs offered by their contractors.
- The approach is to define standard metrics in 6 key program areas. The approach is that the combination of all metrics is the “model.”
- Each metric is evaluated using a standard set of questions.
- The model is best applied by personnel with experience in many programs.
- The evaluation involves 37 inquiry items including the use of mature processes, credentials and training for personnel.
- Successfully beta tested by the AMCOM Safety Office.

“The Model” of System Safety Program Performance

A-P-T Research, Inc.



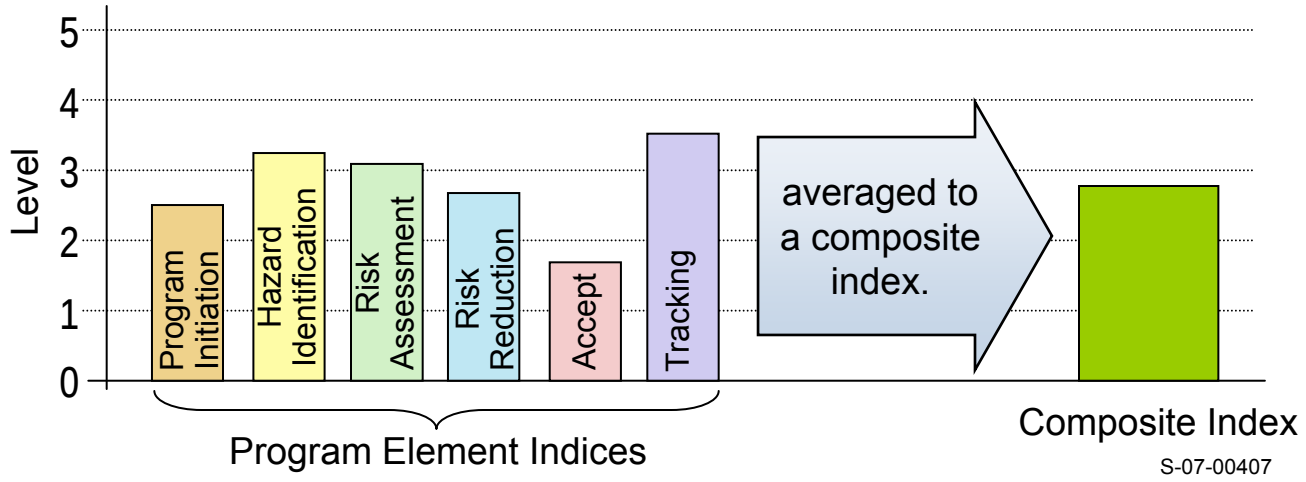
The “System Safety Metrics Method” consists of one composite index supported by 6 element indices. Indices are evaluated by 39 indicators, each evaluated at one of 6 levels.



S-07-00407

Advantages

- Can be easily used to gauge the health of a system safety program throughout its lifecycle
- Can identify safety inadequacies and provide feedback to direct positive corrective action
- Provides prompt results
- Gives tight focus of results on specific areas needing improvement



Career Boarding Process

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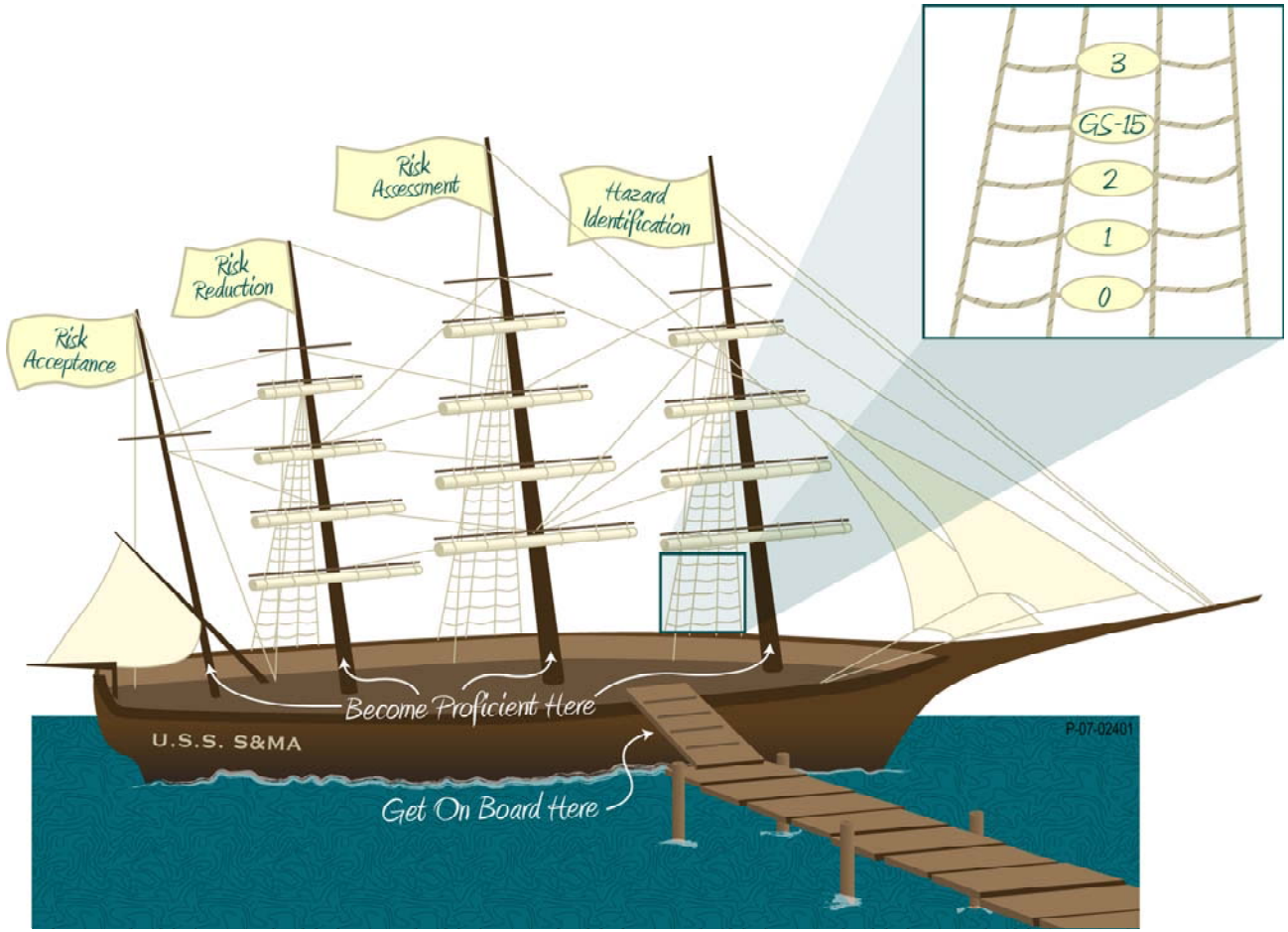
The Boarding Process Includes Five Analogous Elements:

- *In order for S&MA professionals to get aboard, certain minimal qualifications must be met.*
- *Once aboard, the practitioner must learn the ropes associated with the disciplines being practiced. These include overarching principals. In this analogy, the four masts represent the four elements of risk management (Identify, Assess, Reduce, Accept (IARA)) which are applicable in each of the S&MA disciplines.*
- *Advancing up a career ladder is analogous to achieving even higher levels of competence in executing on-board procedures (as a sailor must know the ropes). Thus, the rope ladder symbolizes career advancement.*
- *The common mission of an S&MA organization is analogous to the common mission of a ship and its crew.*
- *The interconnectivity of the disciplines within S&MA is analogous to the multitude of interconnecting lines on a tall ship.*



The Boarding Paradigm

- Multiple disciplines are practiced
- Many tools and techniques are used
- The integrated unit seeks to accomplish a well-defined mission

APT Training Program

A-P-T Research, Inc.

- In 2000, APT developed an explosives safety course on the use of SAFER
  - Contains 17 modules
  - ~250 students have received this training.
- In 2004, APT developed a system safety training curriculum (system safety and advanced system safety).
  - Contains 34 modules
  - ~322 have received this training.
- In 2006, APT developed an explosives safety course on the use of IMESAFR
  - Contains 16 modules
  - ~45 students have received this training.

2008 SEAC Training Initiative

A-P-T Research, Inc.

- In 2008, the Safety Engineering and Analysis Center (SEAC) began an initiative to develop a complete safety training program for APT
- This program includes risk management, system safety, range safety, and explosives safety courses
- There are 127 modules in the program. Status of modules:
  - Outline (26 modules)
  - Material Exists (27 modules)
  - Draft (1 module)
  - Complete (0)
  - In Use (73 modules)

Architecture of APT Safety Training (2008)

A-P-T Research, Inc.

Risk Management Modules

- Concepts in Risk Management
- Risk Management Strategy Selection
- Working with the Risk Assessment Matrix
- A History of Risk Management
- Risk Management Process and Current Practices
- The Taxonomy of Safety Engineering Disciplines
- Risk Acceptance
- Techniques for Risk Summing
- Advantages of Hazard Mapping
- Assessing Uncertainty in Risk Assessments
- System Theoretic Process Analysis (STPA)
- Typical Application of Log-normal, Bi-variant, and Normal Distributions in Safety Disciplines
- Visualizing Risk
- A Universal Risk Scale

8 CEUs

System Safety Modules

Initiating a System Safety Program	Operating and Support Hazard Analysis	Intro to Software System Safety
MIL-STD-882 – Standard Practice for System Safety	Weibull Analysis	Intro to Quality Engineering
Overview of Selected Analysis Techniques	Intro to Sneak Circuit Analysis	Intro to Reliability Engineering
Preliminary Hazard Analysis	Weighted Scoring for Decision Making	Guidelines for Writing Operating Procedures
Fault Tree Analysis	Making Component Failure Probability Estimates	Reviewing Hazard Analyses
Event Tree Analysis	Overview of Human Factors and Operator Error	UK Safety Case Method
Failure Modes and Effects Analysis	Markov Analysis	Exercises: 13+ modules
Cause-Consequence Analysis		

Introduction to Software System Safety	System Software Safety Integration	15 Elements
Identifying Requirements	Tailoring the Effort	Influencing Design
Tracking	Defining Tests	Metrics
Cyclic Software System Safety	Exercises: Identifying requirements	Exercises: Tailoring
Exercises: Tracking	Exercises: Requirements Analysis	

12-15 CEUs

Range Safety Modules

- Introduction to Flight Safety
- The Hazards
- Mitigating and Controlling Hazards
- Flight Safety Modeling
- Range Safety Systems
- Real-Time Operations
- Sample Cases
- Procedure Writing
- Access Control Approaches
- MIL-STD-1901A Interpretation and Compliance
- Missile Ignition Systems
- Flight Termination Systems

8 CEUs

Explosives Safety Modules

General	Lightning Protection
Hazardous Stimuli	Quantity-Distance
Reaction Effects	Accident Investigation
Hazard Classification	Risk Analysis
Insensitive Munitions	Explosives Safety models
Personnel Protection	Explosives Testing
Construction Criteria	Explosives Forensics

8 CEUs

System Safety Training Participants

A-P-T Research, Inc.

- AEPCO, Inc.
- AES
- Air Force Flight Test Center/Test Safety Office
- Air Force Research Laboratories
- AMCOM Safety Office
- AMREDEC-Cargo PM
- ARA, Inc.
- ASC
- ATK Launch Systems
- ATK Thiokol
- Aviation Missile Research & Dev.
- Axios Solutions
- BA-E Hinds Kennedy Space Center
- BAE Systems
- Ballard Power Systems, Inc
- Bath Iron Works (BIW)
- Blast Effects
- Boeing /Integrated Defense Systems
- Canadian Space Agency
- Cargo PM (Camber Corp)
- Chugach
- CPSG
- CSTE-DTC-RT-P
- DPG
- DTC
- Dynetics
- Edwards Air Force Base
- EG&G Technical Services, Inc.
- ESC/SES USAF
- F-15 System Group
- Federal Aviation Administration
- General Dynamics
- General Dynamics-Canada LTD.
- NASA Glenn Research Center
- Headquarters-Army Materiel Command
- HEI
- Hill AFB
- HQ AFMC/SES
- Intuitive Research & Technology
- iRobot
- ITT Industries/SLRS
- JE/Sverdrup
- JPO GMD
- KSC/NASA
- Lockheed Martin Space Systems Co.
- LTPO
- MDA/GMD
- MSFC/MS
- NASA MSFC
- NASA Ames Research Center
- NASA ARC
- NASA Goddard Space Flight Center
- NAVAIR
- Naval Air Warfare Center Aircraft Div.
- Naval Sea Systems Command
- Naval Surface Warfare Center
- NAWC AD 5.2.2. G
- Northrop Grumman Corporation
- NSG
- NSWC-PC NAVSEA
- Office of Director Army Safety
- OO-ALC/SEG
- PEO Aviation Safety
- Picatinny
- Pratt & Whitney Rocketdyne
- PROF
- PRSE
- PRSO
- QDSS/NASA
- Raytheon / Lockheed Martin
- Raytheon Co.
- Redstone Technical Test Center
- Robbins AFB
- ROSS
- RTTC
- SAIC
- SFAE-AV-CH-T
- SIDC/SE
- Sierra Lobo, Inc.
- SMDC
- SUT
- Textron Systems
- The Aerospace Corporation
- Transportation Safety Board/Canada
- U.S. Army Safety Center
- UK C17 IPT
- United Kingdom Ministry of Defense
- United Space Alliance
- United States Navy
- US Army Combat Readiness Center
- USA
- USAF
- USAF WR-ALC/330 ACSSS/ENS
- USASMDC Safety Office
- Warner Robins Air Logistics Center/Engineering
- Weyerhaeuser
- 388 FW/SEY
- 84 SCSB/GBSVY

APT has trained safety professionals from over 100 organizations

"Highly recommend this course for anyone working in the system safety field"

"Outstanding course…should be a do not miss for all system safety professionals"

"I was impressed by the way the course was adapted based on the interest of the class."

Explosives Safety Training

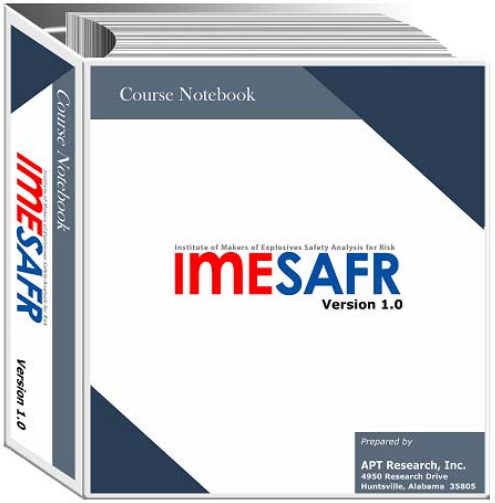
A-P-T Research, Inc.

"Excellent overview of using SAFER."

Course Attendees:

- AFSC
- Bienz, Kummer, and Partner, Ltd.
- DCMA
- DDESB
- DSTA
- Ernst Mach Institute
- MARCORSYSCOM
- MOD UK ESTC
- NASA KSC
- NOSSA
- Norwegian MoD
- Pantex
- SDDC
- Singapore Armed Forces
- SRS Technologies
- Sweden Defense College
- TNO
- USASMDC
- USATCES
- USACE
- USCG

"This system will define how Orica moves forward with new sites and plants as well as existing plants and sites. Excellent tool."



Course Attendees:

- Accurate Energetic Systems
- Alaska Pacific Powder Company
- Austin Powder Company
- Axios
- Detotec
- Dyno Nobel
- Explosives Limited
- Institute of Makers of Explosives
- JRC – Halliburton
- Maxam North America
- Natural Resources Canada
- Orica Australia
- Orica USA
- Owen Oil Tools
- Proc Solutions
- Summa Insurance
- Titan Specialties
- Viking Explosives

2008 Workshops

A-P-T Research, Inc.

- March: Risk Assessment Tool
- August: System Safety Society – “Adding Discipline to Our Discipline”
- November: Risk Summing