

Event Program



International Applied Reliability Symposium

**JUNE 13 - 15, 2012
NEW ORLEANS, LOUISIANA**

Global Issues, Local Perspectives!SM

South America ● North America ● Asia Pacific ● Europe ● India

PROGRAM HIGHLIGHTS

THEME: Sharing applications, success stories and lessons learned in reliability and maintainability engineering.



24 PRESENTATIONS: The program offers twenty-four results-oriented presentations by actual practitioners in industry and government. Topics include: Reliability Program Planning, Design for Reliability (DFR), FMEA, Reliability Growth Analysis, Accelerated Testing, Life Data Analysis, Repairable System Analysis, FRACAS, Reliability Centered Maintenance (RCM), Optimized Maintenance Planning, Risk Analysis, and Reliability ROI.



2 TUTORIALS: The program also includes two tutorials by experts in the field of reliability analysis:

Application Lessons for Effective FMEAs by Carl S. Carlson of ReliaSoft Corporation

Reliability Growth Planning, Analysis and Management by Larry H. Crow of Crow Reliability Resources

VENUE

The 2012 ARS, North America will be held at the **JW Marriott Hotel** in New Orleans, Louisiana. Participants must make hotel reservations on their own, either at the Marriott or at another hotel of their choosing. For details, please see page 4.

INDUSTRY AND GOVERNMENT SHARING SUCCESS STORIES AND LESSONS LEARNED

OTHER SYMPOSIA

The Symposium is held annually at locations throughout the world. Other scheduled events include:

Europe

March 2012

South America

May 2012

India

October 2012

Asia Pacific

October 2012



<http://www.ARSymposium.org>

2012 INTERNATIONAL APPLIED RELIABILITY SYMPOSIUM - NORTH AMERICA

The **International Applied Reliability Symposium** provides a forum for expert presenters from industry and government to come together with reliability practitioners from all over the world to discuss the application of reliability principles to meet real-world challenges. The Symposium has been designed to encourage results-oriented presentations with interactive discussions about best practices, success stories and lessons learned. Most of the presenters have been applying reliability, maintainability and related techniques in their day-to-day work for years.

Symposium Theme: "Sharing applications, success stories and lessons learned in reliability and maintainability engineering."

The Symposium's 24 presentations and 2 tutorials cover a range of subjects, such as:

- | | |
|--|------------------------------------|
| ◆ Reliability Program Planning | ◆ Reliability Growth Analysis |
| ◆ Design for Reliability (DFR) | ◆ Repairable System Analysis |
| ◆ Accelerated Testing | ◆ Optimized Maintenance Planning |
| ◆ Failure Mode and Effects Analysis (FMEA) | ◆ Risk Analysis |
| ◆ Life Data Analysis | ◆ Return on Reliability Investment |

JUNE 13 - 15, 2012
NEW ORLEANS, LOUISIANA

<http://www.ARSymposium.org/northamerica/>

The 2012 event is organized by ReliaSoft Corporation (www.ReliaSoft.com) and the System Reliability Center (SRC.AlionScience.com).

ReliaSoft®



2012 ARS, NORTH AMERICA

2012	Wednesday - June 13th		Thursday -
	Track 1	Track 2	Track 1
7:00 - 8:00	Registration and Check-in (You also have the option to check in on Tuesday from 4 - 7 p.m.) <i>Coffee and pastries served.</i>		<i>Coffee and pastries served.</i>
8:00 - 9:00			Integrated Reliability Improvement Framework for an Enterprise Girish S. Kshirsagar <i>BE Aerospace, Inc.</i>
	Welcome Address (starts at 8:30 a.m. in the Track 1 Room)		T1-S5 <input type="checkbox"/>
9:00 - 9:10	10 Minute Break		10 Minute Break
9:10 - 10:10	The Problem with Probability Elizabeth Lay <i>Siemens Energy</i>	Reliability Simulation of an Expandable Liner Hanger Ganesh Nanaware <i>Baker Hughes</i>	Pitfalls in Conducting and Interpreting the Results of an Accelerated Test Georgios Sarakakis <i>Tesla Motors</i>
	T1-S1 <input type="checkbox"/>	T2-S1 <input type="checkbox"/>	T1-S6 <input type="checkbox"/>
10:10 - 10:30	20 Minute Break		20 Minute Break
10:30 - 11:30	Material Availability: Meeting the Requirement Through Proper Integration of Reliability, Maintainability and Supportability Analyses Marc Banghart <i>Wyle</i>	Benchmarking Your Reliability Program: Are You Just Doing Things Right Or Doing The Right Things? Stan Stephenson <i>Halliburton</i>	Strategic Implementation of Reliability Management: It's Impact on Industrial Lift Trucks Harold (Bud) Johnson <i>NACCO Materials Handling Group (NMHG)</i>
	T1-S2 <input type="checkbox"/>	T2-S2 <input type="checkbox"/>	T1-S7 <input type="checkbox"/>
11:30 - 1:00	1 Hour 30 Minute Lunch Break		1 Hour 30 Minute Lunch
1:00 - 2:00	Using Reliability Tools to Improve a Business' Bottom Line Aron Brall <i>NASA Goddard Space Flight Center</i>	Successful Implementation of Design for Reliability (DFR) and Execution of Reliability Growth Testing (RGT) on the Expeditionary Fighting Vehicle (EFV) Matthew Morningstar <i>United States Marine Corps</i>	Developing an Effective Reliability Program Plan and Basic Required Reliability Analyses During Engineering, Manufacturing and Development Phase Muhammad S. Anwar <i>Naval Air Warfare Center Weapons Division (NAWCWD)</i>
	T1-S3 <input type="checkbox"/>	T2-S3 <input type="checkbox"/>	T1-S8 <input type="checkbox"/>
2:00 - 2:20	20 Minute Break		20 Minute Break
2:20 - 3:20	Reliability Growth Program for 3D Printers – Lessons Learned Daniel Yin <i>Stratasys Inc.</i>	DFROI – Calculating ROI When Implementing a DFR Program Mike Silverman <i>Ops A La Carte</i>	Avoiding Common Reliability Mistakes Andrew Foote <i>Alion Science and Technology Corporation</i>
	T1-S4 <input type="checkbox"/>	T2-S4 <input type="checkbox"/>	T1-S9 <input type="checkbox"/>
3:20 - 3:30	10 Minute Break		10 Minute Break
3:30 - 4:30	Application Lessons for Effective FMEAs Carl S. Carlson <i>ReliaSoft Corporation</i>		The Role of Function Analysis in Design for Reliability and Design for Six Sigma Mohammad Hijawi <i>Chrysler Group LLC</i>
4:30 - 5:00	T1 - Tutorial 1 <input type="checkbox"/>		
5:30 - 6:30	Welcome Reception		Hosted Dinner
6:30 - 9:00			Driving Product Reliability and Service Randolph Phillips, Vice President

SYMPOSIUM PROGRAM

June 14th	Friday - June 15th	
Track 2	Track 1	Track 2
	7:00 - 8:00 <i>Coffee and pastries served. Attendance certificates distributed.</i>	
Application of General Electric's Design for Reliability (DFR) 10-Step Process for Healthcare Equipment Robert A. Belinski <i>General Electric Healthcare</i> T2-S5 <input type="checkbox"/>	Reliability Growth as a Function of Engineering Investment Thomas M. Ryan <i>Rolls-Royce Corporation</i> T1-S11 <input type="checkbox"/>	Design for Reliability: A Roadmap for Design Robustness Moataz Elheddeny <i>Ingersoll Rand</i> T2-S11 <input type="checkbox"/>
	9:00 - 9:15 15 Minute Break	
ATIRCM Lessons Learned – Implementation of a Successful FRACAS Program Craig Shevlin <i>BAE Systems</i> T2-S6 <input type="checkbox"/>	Dynamic Reliability Modeling of Ameren Missouri Fossil Fleet-A Success Story S. Rao Palakodeti <i>Alstom Power</i> T1-S12 <input type="checkbox"/>	Automatic Identification of Parts with Degrading Reliability Performance Shawn McKay <i>The RAND Corporation</i> T2-S12 <input type="checkbox"/>
	10:15 - 10:30 15 Minute Break	
The Transition from MTTF Reliability Predictions into Physics of Failure Reliability Assessments James McLeish <i>DfR Solutions</i> T2-S7 <input type="checkbox"/>	Reliability Growth Planning, Analysis and Management Larry H. Crow <i>Crow Reliability Resources</i> T1 - Tutorial 2 <input type="checkbox"/>	
Break	12:00 - 12:30 Closing and Awards Presentation	
Effectively Analyzing and Communicating Testing Data Harland MacKenzie <i>Dana Power Technology Group</i> T2-S8 <input type="checkbox"/>	 	
Test Laboratory Management: The Glue That Binds Reliability Together G. Michael Smith <i>Magna Powertrain of America</i> T2-S9 <input type="checkbox"/>		
ANSI/GEIA-STD-0009 within the Current DoD Acquisition Framework Andrew J. Miller <i>Northrop Grumman</i> T2-S10 <input type="checkbox"/>		
with Keynote Address Quality in the Oil Services Industry <i>of Reliability for Baker Hughes</i>		

EVENT LOCATION AND HOTEL ACCOMMODATIONS

The 2012 North America Applied Reliability Symposium will be held at the **JW Marriott Hotel** in New Orleans, Louisiana. Please make hotel reservations on your own, either at a hotel of your choosing or at the JW Marriott Hotel. A rate of US\$169.00 for Single/Double (US\$135.00 for government employees) is available to Symposium participants. To be eligible for this rate, rooms must be reserved by **May 21st**. Please refer to “ReliaSoft Corporation” and/or the “Applied Reliability Symposium” when making your reservations. If booking through the website, please enter “rlfrlfa” in the “Group code” field.

NOTE: Given seasonal occupancy rate conditions, the hotel might engage in promotions that occasionally offer a lower rate. Be sure to check the online rates before booking to take advantage of any additional discounts that may be available.



For more information about the venue, or to register online, visit http://www.ARSymposium.org/2012/ars2012_location.htm. For telephone reservations, call 1.888.364.1200 or 1.504.525.6500.

WEDNESDAY JUNE 13, 2012

Welcome Address 8:30 to 9:00 a.m. on Wednesday, June 13th

To begin the event program, Pantelis Vassiliou will represent the Symposium’s organizers by delivering a brief welcome address.

Pantelis Vassiliou is President and CEO of ReliaSoft Corporation. He directs and coordinates ReliaSoft’s R&D efforts to deliver state-of-the-art software tools for applying reliability engineering concepts and methodologies. He also consults, trains and lectures on reliability engineering and related topics to Fortune 1000 companies worldwide. Mr. Vassiliou is the original architect of ReliaSoft’s Weibull++® software and is ReliaSoft’s founder. He holds an M.S. degree in Reliability Engineering from the University of Arizona.

Session 1 9:10 to 10:10 a.m. on Wednesday, June 13th

TRACK 1 Elizabeth Lay - Siemens Energy

The Problem with Probability

Effective risk management is dependent on anticipating probable future events and determining which warrant action or planning to be prepared to respond to the unexpected. Highly resilient organizations are able to bound possibilities for abstract events such that they have a range of possible responses.

This presentation will explore cognitive processes involved in future thinking and the act of constructing future scenarios. Our tendency to focus on past events and details can prevent us from more broad, general thinking that is needed to address uncertainty. We use episodic and semantic thinking for the future as well as the past. Episodic future thinking may help us imagine realistic possibilities for future events. Factors such as hindsight bias, optimistic bias, and the effect of timing (near versus distant) can influence our predictions. People tend to have difficulty identifying catastrophic, never happened yet, events but these risks can cause a company to fail (or come close to it). The BP oil spill and the Toyota mechanical issues are examples of catastrophic events that were extremely costly and were not responded to resiliently. Knowledge of cognition in regard to future thinking and uncertainty are used to suggest improved processes to bound future scenarios as part of a strategy to increase resilience.

TRACK 2 Ganesh Nanaware, Victor Curicuta and Tony Foster - Baker Hughes

Reliability Simulation of an Expandable Liner Hanger

The need for reliability prediction during design and development has been growing due to increasing demand to develop equipment at lower cost, while insuring the quality of the end product. Reliability prediction during liner hanger design is an important aspect of the development process to ensure robustness in real-world applications. A cost-effective robust design can be achieved by integrating reliability simulation with design and Finite Element Analysis (FEA). In the early phases of product development, simulation tools such as HyperStudy®, combined with virtual FEA models, can be used to effectively optimize the liner hanger design to achieve the desired hanging capacity reliability.

Session 2

10:30 to 11:30 a.m. on Wednesday, June 13th

TRACK 1

Marc Banghart - Wyle

Material Availability: Meeting the Requirement Through Proper Integration of Reliability, Maintainability and Supportability Analyses

The reliability of many DoD acquisition programs is currently in a dismal state, as highlighted by the 2010 memorandum released by the Office of the Secretary of Defense. The memo highlights that 33 percent of systems were not found suitable during testing in 2008, with low reliability cited as a major contributing factor. The integration of several reliability and maintainability analyses can yield very successful results that can be utilized to develop an optimized and cost-effective support system. This presentation will provide insight into several analyses such as Reliability Centered Maintenance, Level of Repair Analyses and Reliability Block Modeling, and how these relate to supportability. The presentation focus will not be on how to perform these activities, but rather how to integrate the activities leading to an optimized support structure. Proper integration of these analyses leads not only to a highly available system, but significantly reduces supportability costs.

TRACK 2

Stan Stephenson - Halliburton

Benchmarking Your Reliability Program: Are You Just Doing Things Right or Doing the Right Things?

Within the reliability discipline there is an alphabet soup of tools that can be used. Benchmarking your reliability program against the reliability program of another organization is a good way to determine if you are using the right tools. When conducting a benchmark, identify a best-in-class benchmark organization that has similarities to your organization.

We chose to benchmark Halliburton's reliability program against the US Army's ultra reliability program due to the following three major similarities between the two organizations: 1) Operations are mission (job) based. 2) Failures place people and the environment at risk. 3) Failures can result in large financial losses. This presentation will show features of the US Army's ultra reliability program and how Halliburton has already implemented many of them. Some of the features in their ultra reliability program include:

- Legacy systems are not adequate.
- High reliability is not obtained through reliability "predictions."
- Computer aided engineering (CAE) tools are the most important reliability tools.
- Perception that high reliability is "unaffordable" must be changed.
- Lower-level testing of critical subassemblies is essential.
- High reliability is the direct result of a strong engineering effort, smart testing and management focus.

Session 3

1:00 to 2:00 p.m. on Wednesday, June 13th

TRACK 1

Aron Brall - NASA Goddard Space Flight Center

Using Reliability Tools to Improve a Business' Bottom Line

Errors occurring in business produce waste, which erodes the bottom line: business profitability. Whether errors result in rework, scrap or warranty repairs/replacements due to manufacturing or design errors or incorrectly filling sales orders, improperly invoicing customers or incorrectly paying suppliers due to procedural errors, proper use of reliability tools such as FMEA and Fault Tree Analysis can reduce or eliminate these errors. This presentation presents a win-win proposal for the reliability engineer and the company. By applying reliability techniques to improve business profitability, the business converts the engineer's output into profits and the engineer gains increased job security by increasing the value proposition of reliability engineering to the business. This presentation is an overview of how to apply reliability techniques to business processes, as well as how to present the use of these techniques to management as a profit generator.

TRACK 2

Matthew Morningstar and Nathan Herbert - United States Marine Corps

Successful Implementation of Design for Reliability and Execution of Reliability Growth Testing on the Expeditionary Fighting Vehicle

The Expeditionary Fighting Vehicle (EFV) is a US Marine Corps complex amphibious platform capable of achieving water planning speeds in excess of 25 knots, land speeds of up to 45 mph and imposing lethality through the employment of the MK46 Weapon Station (incorporating the 30mm MK44 automatic gun as well as a 7.62mm COAX machine gun). In its initial Systems Development and Demonstration (SDD), the majority of the key performance parameters were met with the exception of reliability. Therefore, in 2007, the SDD phase was extended to evaluate a second set of EFV prototypes that focused on systems engineering balanced design best practices. Development of the second set of EFV prototypes was based on a Design for Reliability (DFR) approach that resulted in a significantly robust redesign of several mission essential components. Additionally all aspects of the Reliability Growth Testing (RGT) program and associated processes were applied to improve EFV reliability. In conjunction with DFR, state-of-the-art Physics of Failure techniques resulted in a demonstration test that closely aligned with the initial starting point (Mi) of the predicted reliability growth curve.

Session 4

2:20 to 3:20 p.m. on Wednesday, June 13th

TRACK 1

Daniel Yin - *Stratasys Inc.*

Reliability Growth Program for 3D Printers – Lessons Learned

Reliability growth is the improvement of a product's reliability over time through learning the deficiencies of the design and taking actions to eliminate or minimize the effect of these deficiencies. In Stratasys Inc., three stages of reliability growth are deployed to drive reliability improvement for 3D repairable printing equipment. They are early design iterations, development reliability tests on subsystem levels, and the dedicated reliability growth testing (RGT) at the system level.

This presentation shares the stories and lessons learned during implementation of the reliability growth program for the development projects. The main topics include reliability growth planning, the growth through design and development testing, the readiness to start dedicated growth testing, failure data collection and failure mode coding, accelerate growth curve through a multi-phase approach, RGT vs. RDT (reliability demonstration test) for final product testing, and the application of the RGA 7 software for reliability growth analysis.

TRACK 2

Mike Silverman - *Ops A La Carte*

DFROI – Calculating ROI When Implementing a Design for Reliability Program

At last year's Applied Reliability Symposium, we presented a topic on "What is DFR and What is Not DFR," reviewing some of the basic building blocks of Design for Reliability (DFR) along with pointing out some erroneous practices that people today are using.

In this presentation, we will introduce the concept of how to calculate the return on investment (ROI) when implementing a DFR program. The methodology starts with a Reliability Assessment. The questions we ask during the assessment drive the scores which are the inputs to the calculation. We will go through some of the detailed questions within a reliability assessment to show you how to develop the scores and how to perform the ROI calculation from these scores. We will also provide you with some example case studies.

Tutorial 1

3:30 to 5:00 p.m. on Wednesday, June 13th

TRACK 1

Carl S. Carlson - *ReliaSoft Corporation*

Application Lessons for Effective FMEAs

Quality and reliability tools must be applied correctly to get optimum results, and Failure Modes and Effects Analysis (FMEA) is no exception. Yet many companies continue to accept less than effective results from their FMEA applications. Given the increasing importance of uniformly achieving high reliability, it is imperative that FMEA is done correctly and effectively to improve product and process designs early in the product development cycle, and support manufacturing and maintenance applications.

- What are the specific FMEA lessons that separate best practice from poor quality?
- How can we make FMEA live up to its potential for product and process improvements?
- How can FMEAs get done in a timely manner with full support from subject matter experts and management?

This presentation examines and answers these questions for a wide variety of applications. Attendees will understand the primary pitfalls that generate less than effective outcomes and learn the *vital few* keys to successful FMEAs.

CONFIGURE THE SYMPOSIUM TO MEET YOUR INTERESTS AND NEEDS

The Symposium program offers a variety of results-oriented presentations that focus on different ways that reliability engineering methods are applied in different applications, and within different industries. Regular presentation sessions are offered in two simultaneous tracks so you can choose the topic of most interest to you. You can use the matrix on pages 2 -3 to mark the sessions you plan to attend. It is not necessary to pre-register for selected sessions.

Session 5

8:00 to 9:00 a.m. on Thursday, June 14th

TRACK 1

Girish S. Kshirsagar, Michael Lovell
and Merlin Ring - *BE Aerospace, Inc.***Integrated Reliability Improvement Framework for an Enterprise**

The presentation explores a comprehensive approach to addressing real-world problems that span from design to various product life-cycle stages. Areas of integration focus on engineering, quality, repairs, customer support, sales and marketing in the context of reliability engineering practice. This presentation shows how reliability foundations can be built from the ground up, and then put to effective use of a business' enterprise needs. Real-life examples illustrate the success achieved built on reliability data collection and detailed analysis for product design and process improvements.

TRACK 2

Robert A. Belinski - *General Electric Healthcare***Application of General Electric's Design for Reliability (DFR) 10-Step Process for Healthcare Equipment**

General Electric's Design for Reliability (DFR) 10-Step Process is demonstrated by application on the design and verification of the interfaces for the latest magnetic resonance imaging (MRI) device. The process commences with the determination of product level goals and the understanding of the critical subsystems and parts. Critical to this is the knowledge of the functions and baseline failure rates involved. Field data, prototype testing and customer feedback are important sources that must be utilized to create meaningful FMEAs. Early failure mode identification is critical for accelerated component testing because time compression of the multi-million dollar system is not possible.

Session 6

9:10 to 10:10 a.m. on Thursday, June 14th

TRACK 1

Georgios Sarakakis - *Tesla Motors*, William Q. Meeker - *Iowa State University*
and Athanasios Gerokostopoulos - *ReliaSoft Corporation***Pitfalls in Conducting and Interpreting the Results of an Accelerated Test**

As product development cycles become shorter and companies demand more rapid achievement of reliability goals, it is becoming more and more important to use Quantitative Accelerated Life Tests (QALT) to predict and improve reliability. Today there is an abundance of methods to plan and analyze accelerated tests, but there are also many pitfalls.

This presentation will identify some major problems and concerns in conducting and interpreting the results of accelerated tests. We will present various pitfalls, such as using an equal unit allocation at all stress levels, using unnecessarily complex testing and data analysis schemes, violating the monotonic life-stress relationship or choosing an incorrect one for a specific application, assuming an incorrect activation energy, attempting to predict life from a HALT (highly accelerated life test), using QALT at the system level, not having adequate time-to-failure information, extrapolating too far, ignoring the impact of idle time in use rate acceleration tests and not understanding interactions between stresses.

TRACK 2

Craig Shevlin and Jason Petrie - *BAE Systems***ATIRCM Lessons Learned – Implementation of a Successful FRACAS Program**

For a fielded countermeasure system, there is no more direct measure of quality than demonstrated reliability. The United States Army having an urgent need for a reliable infrared countermeasure (IRCM) system in support of the war effort, solicited BAE Systems. The Advanced Threat Infrared Countermeasure's (ATIRCM) system has proven to be truly reliable with exceptional performance. The team developed the tools, prioritized failure trends, identified root causes and implemented corrective actions, resulting in a demonstrated reliability growth of 276% over a 21-month period, delivering significant value to the customer including 100% fielded system availability and significant logistics costs savings.

The ATIRCM reliability program promotes continuous reliability growth by utilizing information gathered from reliability growth tests (RGT), field and production failure incidences, engineering tests, highly accelerated life tests (HALT) and integration activities. Information is processed through a structured Failure Reporting Analysis Corrective Action System (FRACAS) resulting in failure and root cause analysis, development and implementation of corrective action resulting in significant reduction or elimination of the probability of failure recurrence in systems. Corrective action, in general, includes product design changes, changes to the production process or improved selection of parts. Additional testing is performed as necessary to ensure effectiveness of the corrective action.

Session 7

10:30 to 11:30 a.m. on Thursday, June 14th

TRACK 1

Harold (Bud) Johnson - NACCO Materials Handling Group (NMHG)

Strategic Implementation of Reliability Management: Its Impact on Industrial Lift Trucks

Prior to 2001, the Hyster and Yale names (a part of NMHG) had been known for producing rough and tumble lift trucks for several decades. The production lift trucks covered most applications for both occasional and "high-ball" applications. The company was known for providing trucks built to order and would specially design for certain applications. However, customer feedback signaled improved reliability was needed for continued success. Every survey conducted pointed out reliability and minimum downtime was the top-most requirement. As a result, in 2001, NMHG management decided to implement a reliability engineering component into their product development process. This presentation chronicles the implementation of reliability engineering from initial strategic planning, through daily operation, and the adoption of reliability as a core value within the organization and its effect on the customer body.

TRACK 2

James McLeish - DfR Solutions

The Transition from MTTF Reliability Predictions into Physics of Failure Reliability Assessments

Reliability predictions for electronics have traditionally employed an actuarial approach where component field failure data is condensed into statistical failure rate models for basic, generic electronic components. The failure rates of a device's components are tallied to produce a MTBF/MTTF value for that device. This approach from handbooks such as Telcordia SR-332 and MIL-HDBK-217 represent only the "random failure" portion of the hazard function bathtub curve while ignoring "infant mortality" and "end of life wearout" aspects.

Physics of Failure (PoF) research has produced failure mechanism models for electronic components and assemblies based on engineering principles instead of actuarial statistics. Modern computer aided engineering (CAE) tools can use PoF models to perform durability simulations of a specific design, with specific components, operating under specific conditions to produce a more comprehensive reliability assessment. This approach identifies which items fail, when the start of failure can be expected, the rate of failure growth and why the failures occurred. This data can be used to design out failure-susceptible items in order to produce robust, highly reliable systems via a Virtual Reliability Growth process without the time and cost needed for physical prototype testing. This presentation provides an introduction to these PoF tools and methods.

Session 8

1:00 to 2:00 p.m. on Thursday, June 14th

TRACK 1

Muhammad S. Anwar - Naval Air Warfare Center Weapons Division (NAWCWD)

Developing an Effective Reliability Program Plan and Basic Required Reliability Analyses During Engineering, Manufacturing and Development Phase

Developing an effective Reliability Program Plan (RPP) is a vital part of NAVAIR's major weapon programs. An RPP describes the necessary tasks, responsibilities and controls that should be implemented. Importance of the reliability program plan is mentioned in Directive Technical Memorandum (DTM) 11-003, which advises that program managers shall formulate a comprehensive reliability and maintainability (R&M) program using an appropriate reliability growth strategy to improve R&M performance until R&M requirements are satisfied. Therefore, the primary function of RPP is to make sure implementation of certain reliability tasks are assigned to meet reliability requirements of a weapon system under specified conditions.

Most of the major weapon programs development is being done by contractors and therefore it has become very important to flow down a robust reliability program plan that deals with management, schedule, analytical tasks, control management, failure reporting and corrective action implementation (FRACAS), evaluation and testing and reliability growth management. It is the government's responsibility to make sure that the contractors develop a robust RPP, and if implemented accordingly, will surely meet or exceed performance reliability requirements.

TRACK 2

Harland MacKenzie - Dana Power Technology Group

Effectively Analyzing and Communicating Testing Data

One of the key aspects of a good reliability or validation program is communicating the results and progress to others. For those not schooled in the analysis techniques commonly employed (Weibull, accelerated life testing, etc.), this can be quite confusing. While just about everybody is familiar with the concept of "average," the underlying assumptions are often poorly understood. In a lot of cases, the audience may not be technically inclined and, in the increasingly global nature of business, different languages and backgrounds come into play. In this environment, pictures and graphs can be the best tool to communicate results and predictions, especially as information may be passed along with little opportunity for feedback.

This presentation will focus on how to present data and results through graphical means, and explain the implications of the results to diverse groups. Some fundamentals, such as the concepts of natural variation and wearout, will be covered to provide a basis for the techniques presented.

Session 9

2:20 to 3:20 p.m. on Thursday, June 14th

TRACK 1

Andrew Foote - Alion Science and Technology Corporation**Avoiding Common Reliability Mistakes**

This presentation will discuss several common reliability mistakes that have been observed by the staff of the Alion System Reliability Center in its 40+ years of providing consulting services for numerous commercial and government customers. The primary focus of this presentation is to identify key lessons learned that Alion reliability engineers have discovered related to reliability programs that have been formally and informally assessed. Lessons learned include common problems, best-in-class efforts and actionable roadmaps that enable an organization to optimize their reliability program.

The intention of this presentation is to provide other reliability practitioners with guidance they may apply to improve their reliability programs. A secondary goal is for attendees to realize that their reliability issues are not unique and these lessons learned will identify a lot of commonality. This presentation will also specifically outline several common reliability mistakes that result in a loss of product usability associated with predictions/allocation, FMEAs/FMECAs, FTAs, reliability testing and other typical R&M activities.

TRACK 2

G. Michael Smith - Magna Powertrain of America**Test Laboratory Management: The Glue That Binds Reliability Together**

This presentation discusses the architecture and requirements for an effective lab management system. With all the reliability tools available and used, no one has discussed how it all comes together. In most cases, the testing laboratory is where the actual work is either performed or realized.

This presentation discusses the laboratory management and infrastructure necessary to actually execute design controls from design FMEAs, perform accelerated tests or perform reliability demonstration tests. This is how the information is gathered, stored, managed and made available to other parts of the organization. Lab management is a set of processes and procedures that commission the work, track its progress, gather the detail data and report the results. Reliability tools in and of themselves do not allow for the detailed understanding of how all the parts come together.

ARE YOU INTERESTED IN PRESENTING NEXT YEAR?

Do you have a useful reliability application or lesson learned that you would like to share with your colleagues in the field? Would you like to receive complimentary registration to the Symposium? Consider presenting at next year's event!

The "Call for Presentations" for the 2013 ARS, North America will be posted soon after the completion of this year's event. The proposals will be reviewed in **November/December 2012**.

Presentations are selected on the basis of the proposals submitted. Selection criteria includes factors such as 1) clarity and coherence of the proposal, 2) relevance to the conference theme, 3) appeal to a varied audience of practicing reliability/maintainability engineers, 4) usefulness and potential to stimulate active engagement of participants and 5) contribution to scholarship and/or innovative practice in reliability engineering.

As the primary author of a presentation delivered at the ARS, you will receive complimentary registration to the event, a "Presenter" shirt with the ARS logo and our sincere appreciation for helping to make the Symposium thought-provoking and rewarding for your fellow reliability professionals. You will also have a chance to win one of the cash prizes that will be awarded to the top three presentations, as voted by attendees.

For specific details, including the required proposal submission form, please visit <http://www.ARSymposium.org/present.htm>.



Session 10

3:30 to 4:30 p.m. on Thursday, June 14th

TRACK 1

Mohammad Hijawi - Chrysler Group LLC

The Role of Function Analysis in Design for Reliability and Design for Six Sigma

The function analysis is a necessary step to achieve successful Design for Reliability (DFR) and Design for Six Sigma (DFSS) programs. Without knowing the functions of the component or system, it will not be possible to have a complete design FMEA. In addition, the optimization might not be focused on the critical functions. This presentation explains in detail the need for function analysis and the impact of incorrect function analysis. The function model history and details will be covered in the presentation. Practical ways of implementing the function model in DFR and DFSS will be explained.

TRACK 2

Andrew J. Miller and Latoya Spells - Northrop Grumman

ANSI/GEIA-STD-0009 Within the Current DoD Acquisition Framework

In July 1998, the US government cancelled MIL-STD-785B, *Reliability Program for Systems and Equipment Development and Production*, as part of acquisition reform. As a replacement, the ANSI/GEIA-STD-0009, *Reliability Program Standard for System Design, Development, and Manufacturing* has recently been adopted by the Department of Defense (DoD) to influence reliability management, design, manufacturing, and testing practices by DoD contractors. The intent of this new 0009 standard is to provide a "what to do" for contractors to utilize such that processes are optimized to ensure a highly reliable product for the end user. As well, this standard should enable contractors to provide the most value for the least risk in terms of developing and producing highly reliable products.

This presentation provides an overview of the impacts and opportunities resulting from ANSI/GEIA-STD-0009, and how the implementation of these processes can positively influence engineering and manufacturing activities within the current DoD acquisition framework.

Hosted Dinner with Keynote Address

5:30 to 9:00 p.m. on Thursday, June 14th

The Symposium will provide a hosted reception and dinner from 5:30 p.m. to 9:00 p.m. on Thursday, June 14th. You are welcome to bring a guest to this event, which provides an opportunity to interact with colleagues in a comfortable and relaxed setting. As with the rest of the Symposium, the typical style of dress will be "business casual."

The dinner program will feature a keynote address delivered by Randolph Phillips, the Vice President of Reliability at Baker Hughes, responsible for the Corporate Reliability Program across all product lines and services.

KEYNOTE ADDRESS

Randolph Phillips - Baker Hughes

Driving Product Reliability and Service Quality in the Oil Services Industry

Challenging applications, environmental conditions and service execution variation have limited Oil Services companies from delivering the service quality demanded by customers. In this address, we will discuss the transformation occurring in the Oil Services industry to deliver a step change in on-rig service quality. Reliability and quality programs are becoming one proactive structured initiative under the charter "Products and Services Risk Management Program." This includes both Health, Safety and Environment (HS&E) and Performance Risk Management. Past events have highlighted the need for greater oversight on HS&E risks. This, combined with the ever increasing cost of operations and assets, continues to push the cost of failure for both operators and service companies to record highs, and thus the need to bring reliability and quality programs out of the closet and into the forefront of long-term business strategies for Oil Services companies.

This address will review the changes that are happening in the Oil Services industry to bring reliability and quality programs into one program proactively focused on not only mitigating HS&E risks, but also taking on-rig product reliability and service execution to new levels of excellence as one integrated proactive business process. Examples will include drilling, wireline, well completions and production applications.

Randolph Phillips is presently the Vice President of Reliability at Baker Hughes and is responsible for the Corporate Reliability Program across all product lines and services. In 2006, he joined Baker Hughes as the Vice President of Reliability and Quality for the then INTEQ Division of Baker Hughes. Prior to that, he worked 22 years at General Electric with the Aircraft Engines, Aerospace, Transportation and Energy Divisions. Randolph has served also on faculty at Villanova University where he received his BS in Electrical Engineering. He later received his MS and PhD in Electrical Engineering from the University of Illinois in Stochastic Control Systems.

Session 11

8:00 to 9:00 a.m. on Friday, June 15th

TRACK 1 **Thomas M. Ryan and John Gebhard - Rolls-Royce Corporation****Reliability Growth as a Function of Engineering Investment**

Affordability has been defined in terms of development, acquisition and life cycle costs (LCC). Improved reliability is considered a key in reducing direct maintenance cost, a major component of LCC, and increasing system availability. Improved system reliability is achieved through engineering investment. The purpose of this study was to quantify the relationship between engineering expenditures and reliability growth for cost estimating on future programs. It was expected that the relationship would be similar to Duane's reliability growth curve.

TRACK 2 **Moataz Elheddeny - Ingersoll Rand****Design for Reliability: A Roadmap for Design Robustness**

With the increase in global competition, more and more costumers consider reliability as one of their primary deciding factors, when purchasing new products. Several companies have invested in developing their own Design for Reliability (DFR) processes and roadmaps in order to be able to meet those requirements and compete in today's market. This presentation will describe the DFR roadmap and how to effectively use it to ensure the success of the reliability program by focusing on the following DFR elements:

- Customer Requirements: Identifying customer requirements early in the development process will help the organization make the right decisions and trade-offs to meet those requirements.
- Application/Usage Stresses: Understanding the application/usage conditions of any system is a crucial task for any reliability program.
- Failure Mode/Site/Mechanism: Once the application stresses have been identified, multiple techniques could be used to identify possible failure modes for the new design.
- Verification: To verify that the design meets the customer requirements and whether it would perform its function reliably under the identified stresses, different reliability verification tests (e.g., HALT, ALT) could be very helpful.

Session 12

9:15 to 10:15 a.m. on Friday, June 15th

TRACK 1 **S. Rao Palakodeti and Larry Dupre - Alstom Power****Dynamic Reliability Modeling of Ameren Missouri Fossil Fleet — A Success Story**

Alstom Power developed a unique dynamic modeling process for fossil power plants using reliability tools such as Weibull++ and BlockSim. Ameren Missouri, a Midwest utility, and Alstom collaborated in beta testing the process and tools at Ameren's Labadie Power Plant. After successful testing of the process and tools, Ameren decided to use the process for the rest of their fossil fleet.

This presentation shares the success story of how "Dynamic Reliability Modeling" is being used by Ameren Missouri in making objective decisions in outage management, allocation of budgets, setting up key performance indicators (KPIs) and prioritizing projects through future projection of equipment failure events and risk ranking. Ameren developed many what-if scenarios to predict the outcome of different scenarios to select the optimum solution. The presenters will share their experience with modeling, data collection, simulation results and some what-if scenarios.

TRACK 2 **Shawn McKay, Elvira Lorado, Amber Jaycocks and Jason Eng - The RAND Corporation****Automatic Identification of Parts with Degrading Reliability Performance**

A critical aspect of supply chain management is managing the costs caused by parts with poor reliability performance. To do this, the reliability of thousands of parts needs to be assessed on a continuous basis. Often, part failure data is not available or not suited for analysis of all the parts or components a complex organization depends on for its operation (e.g., a manufacturing plant, fleet of vehicles, etc.). In addition, traditional reliability analysis and supporting commercial software are insufficient in analyzing the thousands of parts on a continual basis.

In this presentation, we will demonstrate how logistic data (e.g., tracking part orders in an organization) can be used as a proxy for failure data and with some simple modifications to traditional reliability algorithms the thousands of parts an organization depends on can be systematically analyzed. We apply our methodology to 6,000 components on an Army weapon system and demonstrate the ability to identify specific parts that have degrading reliability.

Tutorial 2

10:30 a.m. to 12:00 p.m. on Friday, June 15th

TRACK 1

Larry H. Crow - *Crow Reliability Resources*

Reliability Growth Planning, Analysis and Management

In order to attain desired reliability objectives, early system prototypes are often subjected to reliability growth testing. This testing may be specifically dedicated to reliability or the testing may be integrated into existing engineering development tests. The importance of reliability growth for the successful attainment of reliability requirements was a key finding of the Defense Science Board Task Force on Developmental Test & Evaluation. In its 2008 report, the Task Force found that the "lack of continuous RAM improvement during design, and the resulting low Initial MTBF and low Growth Potential, are the most significant reasons that systems are failing to meet their operational suitability requirements." The Task Force recommended that "RAM, to include a robust reliability growth program, be a mandatory contractual requirement and document progress as part of every major program review."

This tutorial addresses these important parameters (the growth potential and the initial MTBF), and shows how they are key factors in reliability growth planning and how they are measured and managed during testing. The tutorial presents easy-to-understand methods for developing a planned reliability growth curve and test phase milestones that incorporate the growth potential, growth rates and reliability growth management strategy. The tutorial presents models and procedures to assess reliability growth during development testing. It also discusses common analysis pitfalls that may lead to incorrect conclusions. The models and methods presented in this tutorial are designed for real-world applications and are useful to reliability engineering and program management.

Awards Presentation and Closing

12:00 to 12:30 p.m. on Friday, June 15th

In order to recognize outstanding contributions to the discussion at the event, "Excellent Presentation Awards" will be granted to the primary authors of the top three presentations (as voted by attendees). Ballots and voting instructions will be distributed during Registration. The awards will be presented during this short session at the conclusion of the Symposium.

MAKE THE MOST OF YOUR SYMPOSIUM EXPERIENCE Meet Colleagues, Share Ideas, Explore Available Solutions

Choose the sessions that you will attend

The Symposium offers a choice of 24 presentations and 2 expert tutorials. You can use the matrix on pages 2 and 3 to mark the presentations and tutorials that you plan to attend.

Vote for the top 3 presentations you attended

Please remember that you will have an opportunity to vote for your three favorite presentations. Awards will be presented during the short closing session on Friday.

Take advantage of opportunities to converse with colleagues

The catered breaks between sessions and the hosted dinner on Thursday evening provide good opportunities to talk with, and learn from, fellow reliability practitioners.

Learn about available software tools and services

We encourage you to spend some time visiting the exhibit booths to learn about a variety of available products and services.



2012 International Applied Reliability Symposium, North America



Industry and government
sharing applications, success stories and lessons learned.

June 13 - 15, 2012
New Orleans, Louisiana

Registration Information - One Form Per Attendee

- Advanced Registration** (must be received by April 20, 2012) **\$995.00**
- Standard Registration** **\$1195.00**
- Full-Time Student** (Student ID Required) **\$495.00**

Submit Registration Via Phone, Fax, Web or Mail:

Phone: +1.520.886.0410 **Fax:** +1.520.886.0399 **Web:** <http://www.ARSymposium.org/register.htm>

Mail: ReliaSoft Corporation, 1450 S. Eastside Loop, Tucson, AZ, 85710-6703, USA

Payment Method

- Company Purchase Order** (attached)
We accept Purchase Orders from government and industry on NET 30 terms
- Check/Money Order**
Payable to ReliaSoft Corporation

Credit Card Order (Vcode and credit card billing address are required. Please indicate the billing address below or provide it separately.)

Credit Card: **VISA** **MASTERCARD** **AMERICAN EXPRESS**

Card Number: _____ **Exp:** _____ **Vcode:** _____

Name on Card: _____ **Signature:** _____

Attendee Information

Same as credit card billing address.

Billing Information (if other than attendee)

Same as credit card billing address.

Name:		Name:	
Company:		Company:	
Address:		Address:	
City, State, Zip: (Province, Country)		City, State, Zip: (Province, Country)	
Phone:		Phone:	
Fax:		Fax:	
E-mail:		E-mail:	

Will you be attending the hosted dinner? (check one) ___ With guest ___ Without guest ___ No

What size do you prefer for the complimentary polo shirt? (circle one) S M L XL XXL

Would you like to share your contact information with other participants? (check one) ___ Yes ___ No

Additional Details

ARS reserves the right to cancel/reschedule the Symposium at any time up to 4 weeks prior to its start date. In the event of cancellation, all registration fees will be refunded. ARS is not responsible for other charges, such as non-refundable airline tickets.

- **Hotel Reservations:** You will need to make reservations on your own.
- **Substitutions:** Substitutions are allowed provided that ARS is notified 7 days prior to the Symposium start date.
- **Cancellations:** Cancellations received up to 15 working days prior to the Symposium start date will be entitled to a full refund of the registration fee minus a US\$50 administration fee. After this period, all cancellations will be subject to the full registration fee.
- **No Shows:** Registrants who do not attend and who do not notify ARS of a cancellation are subject to the full registration fee.

The registration fee includes your choice of presentations and tutorials, copies of the *Proceedings* and any other handouts, the Thursday night dinner and refreshments provided during the breaks. A certificate of attendance will be provided. Attendees are eligible for 1 CRP Course Credit and 1.5 CEUs.

Applied Reliability Symposium
c/o ReliaSoft Corporation
Worldwide Headquarters
1450 S. Eastside Loop
Tucson, AZ 85710-6703

Prst Std
U.S. Postage
PAID
Tucson, AZ
Permit #541



**INTERNATIONAL
APPLIED RELIABILITY SYMPOSIUM
NORTH AMERICA 2012**