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*Asia Pacific*

2005

ORCHARD HOTEL, SINGAPORE  
AUGUST 18 - 19, 2005

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## 2005 INTERNATIONAL APPLIED RELIABILITY SYMPOSIUM - ASIA PACIFIC

The **International Applied Reliability Symposium - Asia Pacific** 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 majority of the presenters have been applying reliability, maintainability and related techniques in their day-to-day work for years and the Symposium has been designed to encourage results-oriented presentations with interactive discussions about best practices, success stories and lessons learned.

## SHARING APPLICATIONS, SUCCESS STORIES AND LESSONS LEARNED IN RELIABILITY AND MAINTAINABILITY ENGINEERING



The 2005 Asia-Pacific event is organized by ReliaSoft Asia ([www.ReliaSoftAsia.com](http://www.ReliaSoftAsia.com)) and the Reliability Analysis Center ([RAC.AlionScience.com](http://RAC.AlionScience.com)).



# PROGRAM MATRIX: AUGUST 18 - 19, 2005

## ORCHARD HOTEL, SINGAPORE

2005	Thursday - August 18	Friday - August 19
7:30 - 8:00	Registration	
8:00 - 8:30		<b>SESSION 6</b> Reliability Lifetimes Analysis Based on Warranty Data <b>Kazuyuki Suzuki</b> <i>University of Electro-Communications, Tokyo</i>
8:30 - 8:55	Welcome Address	
8:55 - 9:00	5 Minute Break	
9:00 - 9:55	<b>SESSION 1</b> Making FMEA a More Powerful and Effective Reliability Tool <b>Carl Carlson</b> <i>ReliaSoft Corporation</i>	<b>SESSION 7</b> Different Approaches in the Analysis of Repairable System Data <b>Hongan Lin</b> <i>ReliaSoft Asia</i>
9:55 - 10:15	20 Minute Break	
10:15 - 11:10	<b>SESSION 2</b> Power Converter Reliability - DFR and Accelerated Qualification <b>Bill Tian</b> <i>Hewlett-Packard Company</i>	<b>SESSION 8</b> Reliability Analysis of the CENPES II Project <b>Eduardo Calixto</b> <i>Petrobras</i>
11:10 - 11:15	5 Minute Break	
11:15 - 12:10	<b>SESSION 3</b> Analytical Approach for Reliability Assessment of DIS System <b>K. Jenab, B.S. Dhillon</b> <i>University of Ottawa</i>	<b>SESSION 9</b> Design of Experiments (DOE) for World Class Organizations <b>John Adamek</b> <i>World-Class Quality</i>
12:10 - 1:30	80 Minute Lunch Break Lunch is provided by the Symposium on both Thursday and Friday.	
1:30 - 2:25	<b>SESSION 4</b> System Reliability Assessment: Oil and Gas Perspective <b>Mohammad Zahid Mamot</b> <i>Petronas Research &amp; Scientific Services</i>	<b>SESSION 10</b> Example of a Thermal Cycle Accelerated Life Test on a Consumer Electronic Component <b>Alvin Lee, Nagappan Ganesh</b> <i>Philips Optical Storage</i>
2:25 - 2:30	5 Minute Break	
2:30 - 3:25	<b>SESSION 5</b> Reliability Program in Commercial Environment <b>Julio Pulido</b> <i>Ingersoll-Rand</i>	<b>SESSION 11</b> Improving Product Reliability and Maintainability - ALH Experience <b>K.G. Kumaraswamy</b> <i>Hindustan Aeronautics Limited</i>
3:25 - 3:45	20 Minute Break	
3:45 - 5:30	<b>TUTORIAL 1</b> Essential Elements of a Reliability Program <b>Patrick Hetherington</b> <i>Reliability Analysis Center</i>	<b>TUTORIAL 2</b> Reliability Growth Management and Data Analysis <b>Larry H. Crow</b> <i>Crow Reliability Resources</i>

# THURSDAY AUGUST 18, 2005

## Registration - 7:30 to 8:30 a.m.

The 2005 International Applied Reliability Symposium - Asia Pacific begins on Thursday August 18, 2005 with registration activities from 7:30 a.m. to 8:30 a.m. Thursday's program begins at 8:30 a.m. and includes a brief welcome address, five presentation sessions and a tutorial. Friday's program begins at 8:00 a.m. and includes six presentation sessions and a tutorial. Lunch is provided by the Symposium on both Thursday and Friday from 12:10 p.m. to 1:30 p.m.

Welcome Address	8:30 to 8:55 a.m.
<p>To begin the Symposium program, Patrick Hetherington and Pantelis Vassiliou will represent the Symposium's organizers by delivering a brief welcome address.</p> <p>Patrick Hetherington is the Reliability Analysis Center Director and Manager of Research at Alion Science and Technology with fifteen years experience in the field of applied reliability methods. He routinely serves as Program Manager for projects that strive to optimize maintainability, lower life cycle costs, maintain safety and address design reliability concerns. Mr. Hetherington has managed efforts in support of the DoD, medical, automotive, industrial and transportation industries. Mr. Hetherington is the developer of the RAC's standard Mechanical Reliability Training Course as well as many custom training programs. He received his BSME from Clarkson University and is an ASQ Certified Reliability Engineer.</p> <p>Pantelis Vassiliou is President and CEO of ReliaSoft Corporation. He directs and coordinates ReliaSoft's R&amp;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 the Weibull++ software and ReliaSoft's founder. He holds an M.S. in Reliability Engineering from the University of Arizona.</p>	

Session 1	9:00 to 9:55 a.m.	Session 2	10:15 to 11:10 a.m.
<b>Making FMEA a More Powerful and Effective Reliability Tool</b> <b>Carl Carlson</b> <i>ReliaSoft Corporation</i>	<p>Failure Mode and Effects Analysis (FMEA) has had varying degrees of success, as implemented by companies worldwide. This tool has the potential to be a powerful aid in reducing or eliminating risk from product designs and manufacturing processes to bring about more successful product launches. This presentation examines why FMEA has not been living up to its potential in some companies, and describes how to get more effective results with individual FMEAs and how to implement a more effective overall FMEA process.</p>	<b>Power Converter Reliability - DFR and Accelerated Qualification</b> <b>Bill Tian</b> <i>Hewlett-Packard Company</i>	<p>Power converter failures have been one of the top failure contributors in many electronic products across industry. This presentation addresses the reliability issues and challenges that face today's high performance power converter design and provides a comprehensive reliability analysis and a case study of Design-For-Reliability (DFR) practice on power converters. First, a reliability sensitivity analysis tool is presented and the major reliability contributing factors are analyzed for a typical DC-DC converter design. Then, a case study of power converter DFR practice is provided. The design parameters studied include thermal design, derating design, topology design, mechanical layout, and component quality and applications. Some practical DFR guidelines are provided for power converter reliability design. To meet the short time-to-market demands with high reliability, highly accelerated qualification and supplier management strategy are also discussed.</p>

Session 3	11:15 a.m. to 12:10 p.m.
<b>Analytical Approach for Reliability Assessment of DIS Systems</b> <b>K. Jenab and B.S. Dhillon</b> <i>University of Ottawa</i>	<p>Technical hardware and software systems with advanced technology are often equipped with failure Detection, Isolation and Self-healing mechanisms (DIS). In such systems, continuous checks must be performed while the system is in service. When failures are <i>detected</i>, hardware devices notify the software, which takes appropriate actions and tries to pinpoint the problem down to a replaceable or self-healing subsystem. This <i>isolation</i> step is a key to success in service availability. For <i>self-healing</i> actions, the software may use the hardware resources to remove the failure and return the system to the operational mode or the software alone may perform the self-healing (e.g. by resetting or re-downloading). DIS comprises three stochastic mechanisms made up of the mechanism initiative probability and probability distribution function (<i>pdf</i>). Markov modeling and simulation have been the most common approaches to analyze the reliability of such systems. However, they confront some limitations. Our objective is to present an analytical technique to apply Fault Tree Analysis (FTA) and Reliability Block Diagram (RBD) for reliability assessment of DIS systems.</p>

# THURSDAY AUGUST 18, 2005

Session 4	1:30 to 2:25 p.m.	Session 5	2:30 to 3:25 p.m.
<b>System Reliability Assessment: Oil and Gas Perspective</b> <b>Mohammad Zahid Mamot</b> <i>Petronas Research &amp; Scientific Services</i>		<b>Reliability Program in Commercial Environment</b> <b>Julio Pulido</b> <i>Ingersoll-Rand</i>	
A formal reliability assessment for the oil and gas industry is gaining popularity, especially during the design stage. It provides engineers with opportunities to improve reliability during the design and allows them to justify any improvements in terms of the bottom line. However, being a relatively new technique in this industry, there are some misconceptions on its application that need to be clarified before anyone embarks on this type of assessment. Case studies will be presented to illustrate some of the key points.		Planning a Reliability Program for a commercial product is somewhat more challenging than planning for a government or military regulated contract. The value from incorporating a Reliability Program into commercial development is in the early understanding disciplines to design the reliability into the product. This presentation discusses the methods used at Ingersoll-Rand to create an effective yet cost conscious Reliability Program for the Commercial Environment. The presentation describes a reliability program plan that allows the team to evaluate the reliability of the product early enough in the development cycle to effect timely and cost effective improvements.	

Tutorial 1	3:45 to 5:30 p.m.
<b>Essential Elements of a Reliability Program</b> <b>Patrick Hetherington</b> <i>Reliability Analysis Center</i>	
Making a quantifiable impact on the reliability of a product or system should not be accidental. A reliability plan that is an integral part of the product development process is absolutely essential to cost effectively supporting and driving design decisions from product concept through full-scale production. This tutorial will reflect the essential steps in developing a tailorable reliability engineering process that focuses on the needs of the original equipment manufacturer and the end user. The tutorial will include examples of reliability program benefits and pitfalls as seen from a wide variety of companies and government organizations.	

# FRIDAY AUGUST 19, 2005

Session 6	8:00 to 8:55 a.m.	Session 7	9:00 to 9:55 a.m.
<b>Reliability Lifetimes Analysis Based on Warranty Data</b> <b>Kazuyuki Suzuki</b> <i>University of Electro-Communications, Tokyo</i>		<b>Different Approaches in the Analysis of Repairable System Data</b> <b>Hongan Lin</b> <i>ReliaSoft Asia</i>	
When automobile failures occur within the automotive warranty period, a manufacturer can develop a record of mileages to failure from the owner's requests for repair. When no failures occur during the warranty period, the owner naturally will not report mileages and it may be inferred that "no record of failures" means "no failures." Almost every manufacturer estimates the non-failed automobile mileages that are not observed during the warranty period by using the mileage distribution obtained from the failed automobile mileages. However, this method overestimates the lifetime of automobiles. This presentation proposes the right way to estimate non-failed automobile mileages.		Systems can be categorized into two basic types: one-time or non-repairable systems and reusable or repairable systems. In the latter case, under continuous operation, the system is repaired but not replaced after each failure. For example, if the system is a vehicle and the water pump fails, then the water pump is replaced and, therefore, the vehicle is repaired. The treatment of data obtained from such systems is different than the case of non-repairable systems. In non-repairable systems, the failure data is collected and a representative distribution is fitted to the data in order to perform reliability estimations. On the other hand, in the repairable systems case, the analysis is not as straightforward since a stochastic process is in place. When considering repairable system data, different approaches are available depending on the data and the objective of the analysis. For example, the engineer can analyze the data "directly" by fitting the NHPP-Power Law model. Another approach is to break down the system into its lowest replaceable units (LRUs) and failure modes, obtain the failure distributions of these LRUs and failure modes, and then create the Reliability Block Diagram of the system and analyze it. Each method and model has its underlying assumptions and it is imperative for the analyst to be aware of them. In this presentation, the different approaches of treating repairable system data are reviewed, and the available models for each approach are explained and demonstrated.	

# FRIDAY AUGUST 19, 2005

<b>Session 8</b> <b>10:15 to 11:10 a.m.</b>	<b>Session 9</b> <b>11:15 a.m. to 12:10 p.m.</b>
<b>Reliability Analysis of the CENPES II Project</b> <b>Eduardo Calixto</b> <i>Petrobras</i>	<b>Design of Experiments for World Class Organizations</b> <b>John Adamek</b> <i>World-Class Quality</i>
The Reliability Block Diagram (RBD) methodology, which defines the components of a system in terms of their reliability and availability impacts, will be used in the CENPES II project to provide information to support decisions about project configuration, maintenance policies and stock policies in order to get a high performance system in terms of availability. The CENPES II project is composed of electrical, gas utilities, cold water, diesel utilities and CIPD (integrated process data center) systems. Each system and the whole project will be analyzed using the BlockSim software to simulate availability and reliability, taking into consideration typical stock and maintenance policies. The analyzed results will permit the identification of critical equipment in terms of reliability/availability impact, the best configuration to achieve the availability target and the best stock and maintenance policies, taking into consideration cost impacts on project cash flow.	Cost downs, product optimization, process optimization, reduction of variation and robustness. Learn how world class organizations utilize Design of Experiments (DOE) to achieve superior results. This presentation will provide attendees with an understanding of when to use DOE, the techniques available and how to select the most appropriate technique. The presentation will provide an insight as to how DOE relates to FMEA, SPC, Six Sigma, CPK and other statistical techniques.
<b>Session 10</b> <b>1:30 to 2:25 p.m.</b>	<b>Session 11</b> <b>2:30 to 3:25 p.m.</b>
<b>Example of a Thermal Cycle Accelerated Life Test on a Consumer Electronic Component</b> <b>Alvin Lee, Nagappan Ganesh</b> <i>Philips Optical Storage</i>	<b>Improving Product Reliability and Maintainability - ALH Experience</b> <b>K.G. Kumaraswamy</b> <i>Hindustan Aeronautics Limited</i>
This presentation will demonstrate the concept of accelerated life testing based on field application data so as to reduce the release test time and cost. The concept is based on accelerated life test data modeling to provide an early indication on what type of failure mode would occur during the warranty period. When accelerated life testing is conducted, the common acceleration mode is voltage, temperature or humidity. This example will present an accelerated life test model subjected to thermal cycles (high and low temperature switching). We shall demonstrate the reliability technique, data analysis and methods used to determine the acceleration factor. The empirical findings and benefits resulting from the example will be shared.	The primary objective of this presentation is to share the experience gained in improving reliability and maintainability (R&M) features of the Advanced Light Helicopter (ALH), designed and developed by Hindustan Aeronautics Limited, Bangalore, India. The presentation briefly describes the advanced technology features adopted and their impact on R&M and outlines the reliability management aspects adopted during prototype development and production phases. The specific R&M features incorporated in design are elaborated. The failure reporting, analysis and corrective action system (FRACAS) established for R&M analysis is described and efforts made to improve R&M are illustrated with examples of field service data obtained from customers on initial production batches. The ALH experience reinforces the need for a well-established FRACAS and a system for customer interaction to improve product R&M.
<b>Tutorial 2</b> <b>3:45 to 5:30 p.m.</b>	
<b>Reliability Growth Management and Data Analysis</b> <b>Larry H. Crow</b> <i>Crow Reliability Resources</i>	
In order to attain 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. When failure modes are uncovered during the testing, they are either corrected or not corrected in accordance with the reliability growth management strategy. For a particular program, the management strategy is a key factor in whether or not the desired reliability is attained. To properly manage the reliability growth process, the reliability currently achieved and the projected reliability impact of proposed future corrective actions must be appropriately measured for a particular management strategy. If the projected reliability is not on track to meet the desired goal then the management strategy can be changed. This tutorial will present a proven reliability growth management strategy structure together with widely used models and methods for evaluating the reliability growth based on test data and other engineering input. Several case studies are presented, which illustrate the application of the management strategy concepts and growth models to actual development programs. The models and methods presented in this tutorial are designed for real world applications and are useful to reliability engineers and program management.	

## HOTEL ACCOMMODATIONS

The 2005 Asia-Pacific Symposium will be held at the Orchard Hotel Singapore. Through a special arrangement with the hotel, a Corporate rate of S\$160+++ is available for seminar participants. **Rooms must be reserved by July 28th to be eligible for this rate.**

For reservations, please submit the **Accommodation Booking Form** to the Orchard Hotel or contact [veronica.ann@orchardhotel.com.sg](mailto:veronica.ann@orchardhotel.com.sg). The form is available at [http://www.ARSymposium.org/asia/2005/location\\_as.htm](http://www.ARSymposium.org/asia/2005/location_as.htm).

# The 2005 International Applied Reliability Symposium, Asia Pacific

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

August 18 - 19, 2005  
Singapore

# International Applied Reliability Symposium

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## Registration Information - One Form Per Attendee

- |   |                  |
|---|------------------|
| <input type="checkbox"/> <b>Advanced Registration</b> (must be received by May 1, 2005) | <b>S\$795.00</b> |
| <input type="checkbox"/> <b>Standard Registration</b>                                   | <b>S\$995.00</b> |
| <input type="checkbox"/> <b>Full-Time Student</b> (Student ID Required)                 | <b>S\$195.00</b> |

### Submit Registration Via Phone, Fax or Mail:

Phone: +(65) 6272 7422      Fax: +(65) 6272 6687      Malaysia Office (Toll Free): 1800806214  
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## Payment Method

<input type="checkbox"/> <b>Company Purchase Order</b> (attached) We accept Purchase Orders from government and industry on NET 30 terms	<input type="checkbox"/> <b>Check or Money Order</b> Made payable to ReliaSoft Asia Pte Ltd
<b>Credit Card Order</b> (Vcode and credit card billing address are required. Please indicate the billing address below or provide it separately.) Credit Card: <input type="checkbox"/> <b>VISA</b> <input type="checkbox"/> <b>MASTERCARD</b> <input type="checkbox"/> <b>AMERICAN EXPRESS</b> Card Number: _____ Exp: _____ Vcode: _____ Name on Card: _____ Signature: _____	

Attendee Information	Billing Information (if other than attendee)
<input type="checkbox"/> Same as credit card billing address.	<input type="checkbox"/> Same as credit card billing address.
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<b>Phone:</b> _____	<b>Phone:</b> _____
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## Additional Information

- **Hotel Reservations:** You will need to make reservations on your own. Please submit the **Accommodation Booking Form** to the Orchard Hotel or contact [veronica.ann@orchardhotel.com.sg](mailto:veronica.ann@orchardhotel.com.sg). To download form: [http://www.ARSymposium.org/asia/2005/location\\_as.htm](http://www.ARSymposium.org/asia/2005/location_as.htm)
- **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 S\$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 cancellations are subject to the full registration fee.
- 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 any other charges, such as non-refundable airline tickets.

**Registration fee includes** attendance to all presentations, copies of the proceedings and any other handouts, daily lunch and refreshments provided during the breaks. A certificate of attendance will be provided.

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# **Applied Reliability Symposium**

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