

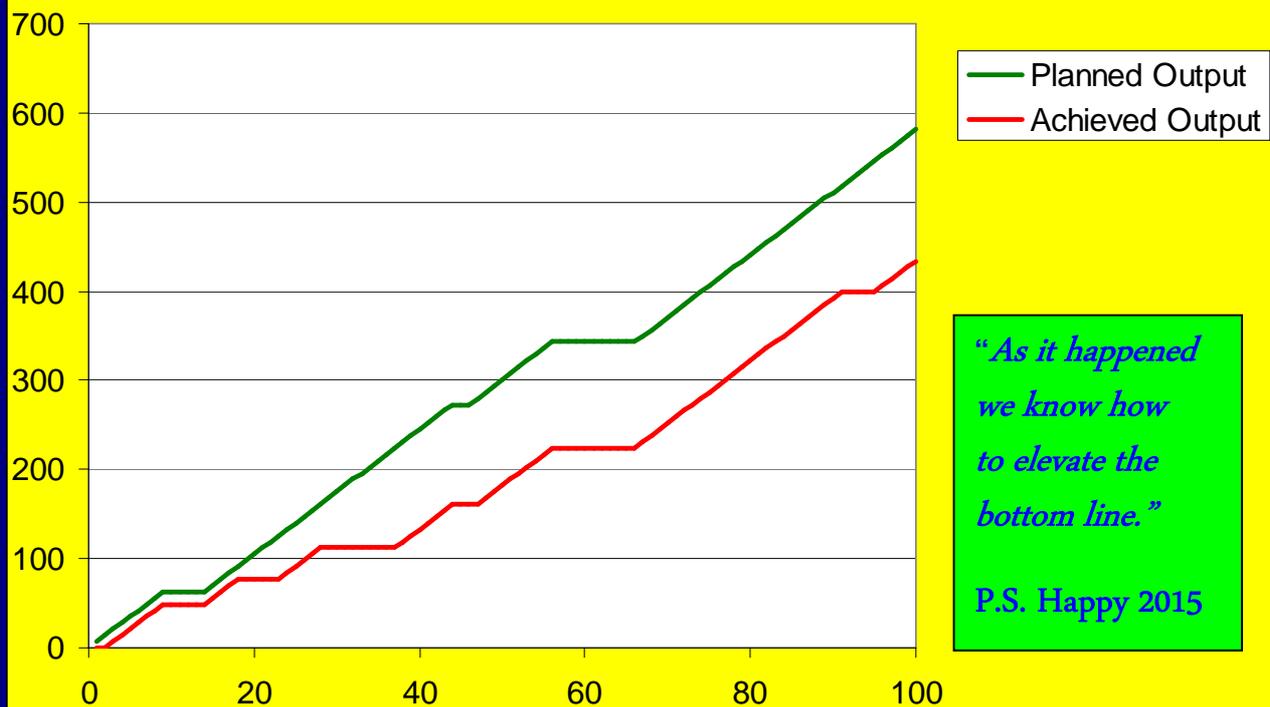
# 24<sup>th</sup> MIRCE International Symposium

2 – 4 December 2014, Woodbury Park, Exeter, UK

## Maintaining Operational Effectiveness

- *Mirce Mechanics\* Methods, Principles & Tools* -

### System Operational Effectiveness



“It is readily accepted that a **“bottom line takes organisation forward”**, but it is not well understood that a main task of maintaining operational effectiveness is not “repair” of system’s failures, but their management in the manner that maximises operational effectiveness, quantified through: profit, customers’ satisfaction, loyalty, reliability, punctuality and other desirable properties of maintainable systems.

To create and manage operationally effective systems a full understanding of the mechanisms of **Mirce Mechanics** is necessary as they drive systems through positive and negative functionality states. These mechanisms are of a complex nature as they result from strong interactions between physical properties of a system, in-service environmental conditions and associated human actions.

Hence, you are warmly invited to join us and learn more about methods, principles and tools that we developed to elevate the bottom line to the level at which everybody is happy, from the producer to the user, as well as the life supporting environment. “

Dr J. Knezevic, Founder & President of the MIRCE Akademy

# The Symposium Programme at Glance

0830- 0900	Registration and welcome coffee, Woodbury Park Hotel,
0900 - 1030	<i>Maintaining Operational Effectiveness – Concept, Philosophy and Methods</i> Dr Jezdimir Knezevic, Founder & President, Mirce Akademy, UK
1030-1100	Morning Coffee
1100-1200	<i>Maintaining Operational Effectiveness (Revenue) - continue</i>
1300 -1400	Lunch Break
1400 -1530	<i>Maintaining Operational Effectiveness (Cost) - continue</i>
1530-1600	Afternoon Tea
1600 -1730	<i>Maintaining Operational Effectiveness (Profit) - continue</i>
18.15-19.30	 <p><b>MIRCE Akademy Annual Lecture</b> Operational Research – Solutions for Problems Dr John Crocker, Science Fellow of the MIRCE Akademy</p>
<b>&gt;&gt;&gt;&gt;&gt; Wednesday 3<sup>rd</sup> December 2014 &lt;&lt;&lt;&lt;&lt;</b>	
0830- 0900	Registration and welcome coffee, Woodbury Park Hotel,
0900 - 1030	<b>Maintenance Effectiveness – The Hidden Costs</b> Wg Cdr CJ Hockley OBE CEng MRAeS RAF (Rtd) EPSRC Centre for Through-Life Engineering Services (TES), Cranfield University
1030 - 1100	Morning Coffee
1100 – 12.00	<i>Tour of Distributions</i> John Thompson, Science Fellow of the MIRCE Akademy
1.200 – 1300	<i>The Maintenance Equation – Is it in balance?</i> Tony Martin, A2D Ltd. & Honorary Fellow of the MIRCE Akademy
1300 -1400	Lunch Break
1400 - 1530	<b>Quality of Maintenance – Mirce Mechanics Axiom</b> Dr J. Knezevic, MIRCE Akademy, Exeter, UK
1530-1600	Afternoon Tea
1600 - 1700	<i>Impact of Simplified Technical English of System Effectiveness</i> Orlando Chiarello, Secondo Mona, Italy
1900 - 1930	Get Together Sherry Reception at Woodbury Park Golf Hotel
1930-2230	<p><b>Symposium Dinner &amp; MIRCE Akademy Members Christmas Dinner</b></p>  <div style="border: 1px solid black; padding: 5px;"> <p>Formula 1 Reliability &amp; Effectiveness Centre, of the MIRCE Akademy Announcement and Award of</p> <ul style="list-style-type: none"> <li>• 2014 Formula 1 Driver Reliability Champion</li> <li>• 2014 Formula 1 Team Reliability Champion</li> </ul> <p>In accordance to the Mirce Mechanics based analysis</p> </div>
<b>&gt;&gt;&gt;&gt;&gt;&gt; Thursday 4<sup>th</sup> December 2014 &lt;&lt;&lt;&lt;&lt;&lt;</b>	
0830– 0900	Registration and welcome coffee, Woodbury Park Hotel,
0900 – 10.30	<b>Master Class</b> <i>Counterfeit Electronics Components Avoidance and Detection</i> Dr Diganta Das, CALCE, University of Maryland, USA
10.30 -11.00	Morning coffee
11.00-13.00	<i>Counterfeit Electronics Components Avoidance and Detection - continue</i>
1300 – 1400	Lunch Break
1400-1530	<i>Counterfeit Electronics Components Avoidance and Detection - continue</i>
1530-1600	Afternoon Tea
1600-1715	<i>Counterfeit Electronics Components Avoidance and Detection - continue</i>
1700-1715	Group Photo and Departure

## Maintaining Operational Effectiveness

Commonly, maintenance is perceived as “fixing broken things”. As such, it is associated with failures, unplanned down times and huge expenses, each of which negatively impact customer satisfaction and bottom line. However, as failures are an inevitability of the life of any maintainable system, it would be worthwhile to start looking at maintenance as opportunity for positive impact on the “bottom line” and customer satisfaction.

Consequently, the main objective of the Master Class is to present the Mirce Mechanics approach to maintenance. It is focused on the way that failures, once scientifically understood, could be managed in the way that reduces the number of in-service interruptions and maintenance cost, while increasing revenue and profit.

The Master Class is aimed at organisational high-level decision makers, who should learn what could be done by the new approach to maintenance rather than to show them how it should be done. Members of the organisations with the wider horizons are needed to fully appreciate the opportunities presented to them by Mirce Mechanics to increase organisational competitiveness or customer satisfaction.

To quantify the financial impact of maintenance on the profit, it was necessary to modify the main equation of economics that states that the profit is the difference between revenue and cost. Hence, the Mirce Mechanics based expression for profit has the following form:

$$\text{Profit} = \begin{cases} \text{Revenue}_{y(t)} - \text{Cost}_{y(t)} > 0 & \text{Gain} \\ < 0 & \text{Loss} \end{cases} \quad \text{where: } y(t) \text{ is Mirce Functionability Equation}$$

The main topics to be discussed at the Symposium are

- Current, Maintenance Budget Based, Maintenance Management Process
- Mirce Mechanics, profit based, Maintenance Management Process
- Physical Mechanisms of Maintenance Process
- Relationship between Business Plan and Maintenance Plan
- Quantitative assessment of Cost and Revenue of feasible maintenance plans
- Case study and Lessons Learned
- Recommendations regarding the application of the new method

Several numerical examples will be used during the Master Class to illustrate the benefit of the Mirce Mechanics based Maintenance Planning and Management.

Finally, it will be shown that a person with the knowledge of the Mirce Mechanics must have a seat in the Board Room of any public or private organisation that is committed to run highly reliable and cost effective organisation.

## Maintenance Effectiveness – The Hidden Costs

Maintenance Managers like to think they are efficient and effective and their organisation is doing a great job. Initiatives come and go and some help and some are merely window dressing. Some managers will be proactive in reducing waste in their organisations whether it be waste of resources, waste of time or waste of effort.

However, to be successful requires an admission that there is waste in the first place and sometimes, depending on the type of waste identified or perceived, this can be difficult or unwise to do. Admitting where the waste is and what needs to be done requires many things to come together. Identification of the waste and the hidden costs must be done and a major one that many organisations either do not recognise or are unwilling to tackle, is the problem of No Fault Found (NFF).

Using a benchmarking tool developed by the EPSRC TES Centre, is a first step to focus on the hidden costs of NFF. Some NFF case studies will demonstrate the hidden costs and the benchmarking tool will be described.

## **A Tour of Distributions**

What distributions do you use to model your product/services? Is it just the normal set? The best distribution is the THOMPSON-KNEZEVIC distribution which can predict with great accuracy any parameter. Do you use distribution to predict future events with low risk (low risk [1%] of losing money)?

What is the link between?

1. Number of birds hatched and the effectiveness of a mine.
2. The length of bolts and floods.
3. Witches and engineers judgment.

THOMPSON-KNEZEVIC distribution is a fiction, at the moment. I'm just using it to illustrate that you can use any distribution to model a parameter, as long as it satisfies the mathematical rules and the philosophy of the parameter.

## **The Maintenance Equation – Is it in balance?**

From simple equipments to complex systems who should conduct maintenance? Should it be the operator or should it be the maintainer, does one size fit all? Quite often a logistic support process has identified who would undertake maintenance activities based on custom and organisational structure, however it does not appear to identify who should undertake the activity to minimise errors and maximise efficiency.

Many definitions of maintenance levels (e.g. Level 1, 2, 3) are often linear in construct, vague and subject to interpretation by end users. With advances in technology and system complexity, do terms such as servicing and maintenance by replacement now fit traditional skill levels? This paper looks at some of the challenges centred around the maintenance equation.

## **Quality of Maintenance – Mirce Mechanics Axiom**

Quality of maintenance process is quantifiable in statistical terms related to the occurrences of maintenance faults and errors. However as statistics does not study the causes of statistical behaviour, full understanding of the quality of maintenance is only possible by understanding physical causes and mechanisms that lead to the occurrence of maintenance faults during the maintenance process. Based on the analysis of tens of thousands of maintenance tasks in defence, aerospace, transportation (including Formula 1 Grand Prix racing), communication and other industries the author has formulated the second Axiom of Mirce Mechanics, which is: The probability of faulty execution of any maintenance task is greater than zero.

This axiom has a profound impact on all aspects of the life on any maintainable system, such as: reliability, availability, safety, cost, effectiveness and many others, on one hand, and associated processes like: manufacturing, operation, logistics support, on the other

## **Impact of Simplified Technical English on System Effectiveness**

The second Axiom of Mirce Mechanics, states, "The probability of faulty execution of any maintenance task is greater than zero". Analysis of maintenance processes clearly shows that ineffective communication between system designers and maintenance personnel, through maintenance documentation, is a well-recognised contributor to the occurrence of faulty maintenance task, which in turn could have a significant impact on reliability, availability, safety, cost and effectiveness of maintainable systems. This presentation addresses the lack of understanding of maintenance manuals, written in English, by 80% of the global maintenance personnel whose native language is not English. The majority of them have knowledge of English that is rather limited and are easily confused by complex sentence structures and by the number of meanings and synonyms that English words may have. Significant improvements in the direction of effective communication have been achieved by the creation and use of Simplified Technical English, the impact of which is presented in this paper

## **Master Class:**

### **Counterfeit Electronics Components Avoidance and Detection**

Counterfeit electronics components continue to make news. In recent years, the prevalence of these fake parts has only increased, with reports of parts discovered in military systems, medical devices and process control equipment. The elements of the methods that broadly define the methods of protecting your organization include: Supply chain management (proper procurement policies), Supply chain level authentication, and Law enforcement and government policies

There is NO alternative to good supply chain management as a defense against counterfeit parts. Much of the problem regarding counterfeit electronics is due to lack of due diligence by the part buyers. Understanding of the supply chain and assessing the supply chain before engaging them are necessary steps for any organization. Many types of products that have to be manufactured and supported for long periods of time lack control over critical parts of their supply chain, e.g., avionics and space, telecom infrastructure, and industrial controls. As a result, the components and technologies that these products depend on become obsolete long before the product's field life (and sometimes manufacturing life) ends. One of the reasons of companies becoming victim of counterfeit electronics is lack of planning for obsolescence and making distress purchase from unauthorized sources.

The first half of this course will take the attendees through the steps of assessment of parts, manufacturers, and distributors; the various tagging and serializing techniques that are proposed and in use, the impacts of the government and law enforcement policies in the counterfeit part avoidance process. Second half of this workshop will be on parts assessment, inspection and materials. We begin with a thorough discussion on process change notices. It then discusses the effectiveness of various non-destructive techniques and destructive processing steps for inspecting suspect counterfeit components.

The Master Class coverage will prepare the attendees for adherence to SAE Aerospace Standards on counterfeit parts on policy, distributors and test laboratories, respectively the SAE 5553 (adopted and in revision), SAE 6081 (in ballot), and SAE 6171 (in ballot). The presenter has been closely involved with the development of these standards and the attendees to the class will have insight on how best to adopt and utilize these standards to the advantage of your organization.

The Master Class is aimed at Engineers and Managers tasked with developing counterfeit prevention policies for a company which will find this course valuable. This course prepares them to not only create a policy for the company but also allows them to assess if the policies of their supply chain partners are strong and can contribute to the problems of counterfeit parts. The quality managers and test engineers tasked with detection of counterfeit parts will get introduction to techniques that go far beyond the visual inspection and prepare the company in detecting well-made counterfeit parts. Master Class attendees will also learn how to effectively engage testing laboratories in a cost effective manner to determine risk of counterfeit

**Professor Diganta Das PhD**, Mechanical Engineering, University of Maryland, College Park, B.Tech, Manufacturing Science and Engineering, Indian Institute of Technology) is a member of the research staff at the Center for Advanced Life Cycle Engineering. His expertise are in the areas of High Temperature Electronics and Uprating, High Temperature Interconnects, LED Reliability and Testing, Electronic Component Reliability, Electronic Part Selection and Management, Reliability Statistics, Supply Chain Management, Counterfeit Electronics, Component Prognostics, and Medical Electronics.

He is an Associate Editor for the journal Microelectronics Reliability and Circuit World. He is a Six Sigma Black Belt and a member of IEEE, IMAPS and SMTA.





**Exeter** is the most southwesterly Roman fortified settlement in Britain. Exeter Cathedral was founded in the early 12th century and has several notable features, including an early set of misericord, an astronomical clock and the longest uninterrupted vaulted ceiling in England. Today, Exeter is identified as one of the top ten most profitable locations for a business to be based or to gain University education.

## Administrative and Financial Information

For the planning purpose, of the participants, exhibitors and presenters, the following Price structure will be applied regarding all services related to the 24<sup>th</sup> MIRCE International Symposium on System Operational Effectiveness.

To secure a single room at **£75.00** or double at **£95.00** per night for B&B, at the 4 star Woodbury Park Hotel, please quote MIRCE, when making the booking. Hotel provides free and safe parking facilities.

All prices are in GB Pounds	2 - 4 December			4th December ONLY		
	Price	VAT	Total	Price	VAT	Total
Participant	595.00	119.00	714.00	295.00	59.00	354.00
Presenter	245.00	49.00	294.00	Not Applicable		
Retired participants	275.00	55.00	330.00	295.00	59.00	354.00
University students	295.00	59.00	354.00	295.00	59.00	354.00
Congress Proceedings on CD	150.00	30.00	180.00	Not Applicable		
MIRCE Akademy Members	550.00	110.00	660.00	295.00	59.00	354.00
MIRCE Akademy Fellows	575.00	115.00	690.00	295.00	59.00	354.00
MIRCE Akademy Students	275.00	55.00	330.00	295.00	59.00	354.00
Symposium Dinner only	50.00	10.00	60.00	Not Applicable		

## About the Venue

Woodbury Park is a magnificent 500 acre complex set among rolling hills above the South West English coastline, only a few miles from Exeter.

Communication between Exeter and other parts of the United Kingdom are excellent.

**By road**, the M5 motorway links Exeter to London, the Midlands, Scotland and Wales. Regular rapid coaches run services to and from London and Heathrow Airport.

**By rail**, a regular fast service is available to and from Exeter (St David's Station) and London (Paddington Station).

**By air**, Exeter Airport offers regular flights to many British and Continental destinations and is situated near to Woodbury Park.

Travel between Exeter and Woodbury normally requires a car or taxi.

**Among the outstanding leisure facilities at Woodbury Park are two golf courses including the magnificent Oaks Championship course, tennis courts, a swimming pool, spa, sauna and fully equipped gymnasium and well appointed lounge areas and bars.**

Woodbury Park, Woodbury, Exeter, EX5 1JJ, United Kingdom

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🌐 [www.woodburypark.co.uk](http://www.woodburypark.co.uk)

## About the MIRCE Akademy

Mirce Akademy is an independent research and educational institution devoted to the enhancement and applications of Mirce Mechanics – scientific theory of the motion of functionality through the life of maintainable systems.

The knowledge and methods of Mirce Mechanics have benefited designers, manufacturers, constructors, operators, service-providers, regulators and others in the aerospace, automotive, communication, construction, defence, transport, service, utility sectors and other areas of business and government.

Benefits of scientific based knowledge are experienced through significant increase in system reliability and availability, while drastically reducing costs of making, running and disposing systems.



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Woodbury Park Hotel & Golf Club, Exeter, EX5 1JJ, UK – home of the MIRCE Akademy

## 24<sup>th</sup> MIRCE International Symposium

# Maintaining Operational Effectiveness: 2 - 4 December 2014

### Registration Form

Email: [quest@mirceakademy.com](mailto:quest@mirceakademy.com)

Phone: +44 (0) 1395 233 856

Mail: MIRCE Akademy, Woodbury Park, Exeter, EX5 1JJ, United Kingdom

Web site: [www.mirceakademy.com](http://www.mirceakademy.com)

THIS FORM MAY BE COPIED

**Please select appropriate level of service and corresponding fee.**

**Group discounts are available please contact us.**

#### *The Symposium Fees includes:*

- Attendance
- Symposium Material and Supporting Materials
- Lunches and Light Refreshments
- MIRCE Akademy Annual Lecture
- Christmas Dinner on 3<sup>rd</sup> December
- Visit to Auto Racing Championship Centre

#### **Value Added Tax (VAT)**

Unless special exemption exists, under UK Customs and Excise regulations delegates from all countries are required to pay UK VAT @ 20 % on all courses taking place in the UK. Non-UK delegates may be able to recover VAT incurred via the relevant tax authority in the country of origin of the delegate.

#### **PAYMENT DETAILS**

Please invoice my organisation (**Note: UK MOD personnel can pay by BACS through the DBA – Contractor Number will be supplied with invoice**)

For the attention of \_\_\_\_\_

Purchase Order No. \_\_\_\_\_

**Please Charge credit card £ \_\_\_\_\_**

Visa                      MasterCard                      Amex

Cardholder \_\_\_\_\_

Card No. \_\_\_\_\_

Expiry Date \_\_\_\_\_ Security Number \_\_\_\_\_

Signature \_\_\_\_\_

#### **PERSONAL DETAILS** (Please print clearly)

Surname \_\_\_\_\_

First name \_\_\_\_\_

Organisation \_\_\_\_\_

Department \_\_\_\_\_

Position \_\_\_\_\_

Address \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Postcode \_\_\_\_\_ Country \_\_\_\_\_

Tel \_\_\_\_\_ Fax \_\_\_\_\_

E-mail \_\_\_\_\_

Special requirements                      Yes                      No

Please specify  
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I understand and accept the registration terms and conditions as shown

Signature \_\_\_\_\_ Date \_\_\_\_\_

#### **Terms and Conditions**

Substitution of participants may be made at any time. If you intend to do this, please advise the MIRCE Science ('the organiser') as soon as possible. Cancellation of a booking must be received in writing by the organiser at least 14 days before the commencement of the Symposium. MIRCE Science regrets that no refunds or credits will be made after the deadline unless the organiser cancels the Event.

The organiser reserves the right to alter the programme or cancel the Summer School at its discretion. All places offered are subject to availability.