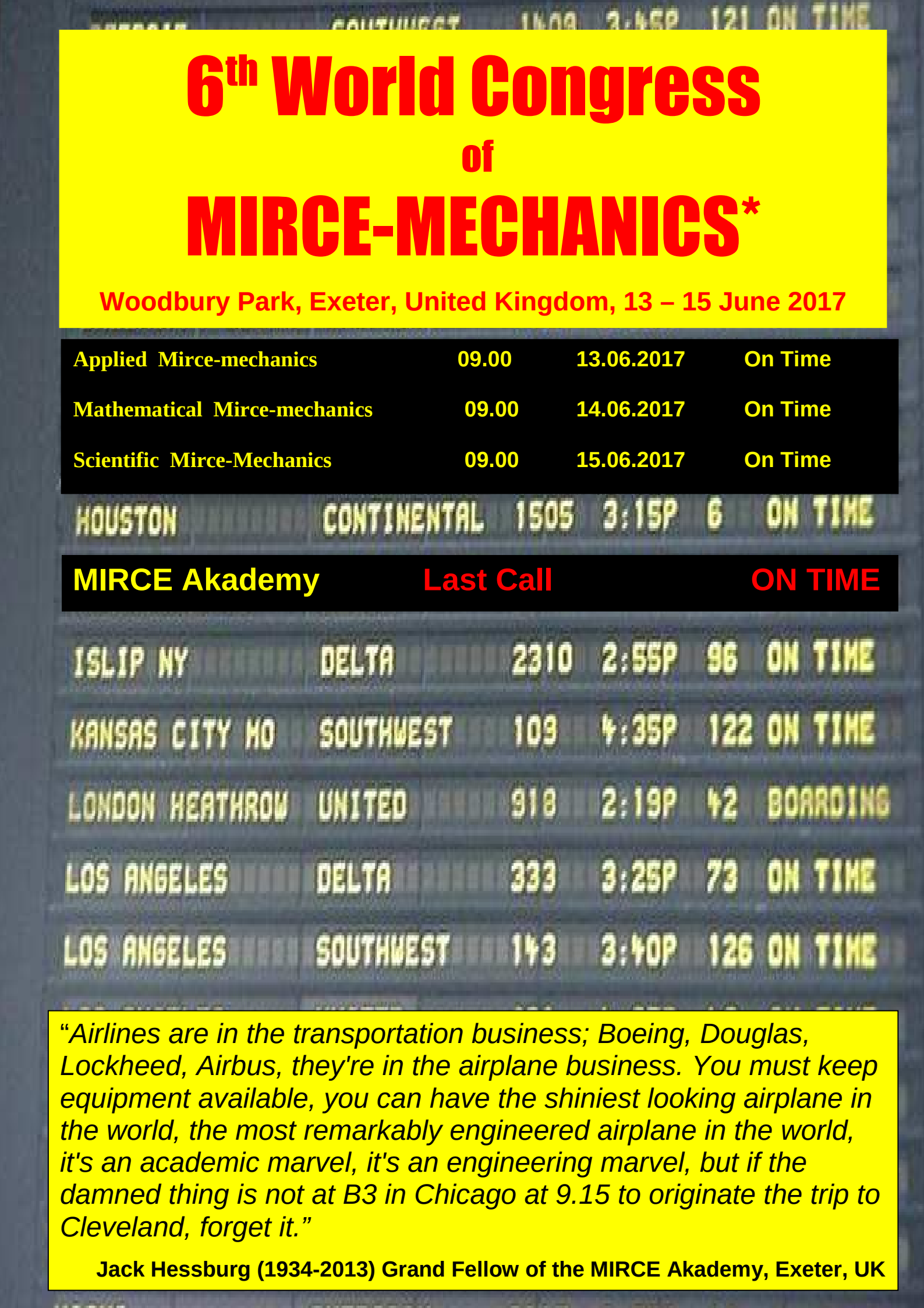
6th World Congress of MIRCE-MECHANICS*

Woodbury Park, Exeter, United Kingdom, 13 – 15 June 2017

Applied Mirce-mechanics	09.00	13.06.2017	On Time
Mathematical Mirce-mechanics	09.00	14.06.2017	On Time
Scientific Mirce-Mechanics	09.00	15.06.2017	On Time



"Airlines are in the transportation business; Boeing, Douglas, Lockheed, Airbus, they're in the airplane business. You must keep equipment available, you can have the shiniest looking airplane in the world, the most remarkably engineered airplane in the world, it's an academic marvel, it's an engineering marvel, but if the damned thing is not at B3 in Chicago at 9.15 to originate the trip to Cleveland, forget it."

Jack Hessburg (1934-2013) Grand Fellow of the MIRCE Akademy, Exeter, UK

A personal invitation from Dr Jezdimir Knezevic, Founder & President of the MIRCE Akademy

Since 1975 I have been actively involved in the research and teaching of numerous specialist engineering disciplines that address specific in-service characteristics of the components of maintainable systems, like reliability, maintainability, supportability, testability, availability and similar. However, in the late 1990s I became fully aware that, despite the fact all of these specialist subjects have their own specifications and contractual requirements, there was nothing to "normalise" them and predict the overall in-service performance of maintainable systems. The reality was, it was impossible to accurately calculate how many daily flights "to Cleveland" are likely to be delivered on time during the in-service life of a given aircraft design or how much electrical energy will be delivered by a given design option for a power station.

Hence, it became crystal clear to me that the purpose of every maintainable systems is **NOT** to deliver R,M,S,T,A and similar requirements . The purpose is for it to do the **WORK**. Nothing is intentionally specified, designed, produced and acquired by somebody in order to do nothing. To allow me to fully address the complicated problem of generating accurate predictions of the work done and resources consumed by maintainable systems, throughout its o life, I resigned from Exeter University, UK, in 1999 and established the MIRCE Akademy at Woodbury Park, Exeter, UK.

Tears and years of intensive research have generated a new, science-based, body of knowledge, named Mirce-mechanics. It comprises axioms, laws, mathematical equations and calculation methods that enable accurate predictions of the work done by the system[1] and the work require to be done on the system to maintain the flow of functionality through life. Thus, from now on, design teams will be able to "normalise" all feasible solutions using comparative analysis and then select the most suitable compromise for all stake holders, based on their through life needs. It is an imperative as a maintainable system comprises not only the entity delivering functionality but every facet of the universe that is needed to operate and maintain it. This includes, but is not limited to: the time it is intended to operate; the capacity it has to do work in a given time; the supplies and resources required to sustain and maintain its operation; the capability of the supplies and resources to provide sustainment and maintenance, the environment around it (weather, dust, contaminants), location (global and installed), access (physical and operational), financial constraints and many more.

The main objective of the Congress is to bring together scientists, mathematicians, engineers, operators, maintainers, logisticians, programmers, economists and other experts to spend a few days together and learn the complexity of the process govern by the Mirce-mechanics methods to quantify the consequences of their specialist decisions on the future performance of maintainable systems.

I am looking forward to welcoming you to the MIRCE Akademy, during this unique global event, as a paper presenter, master class presenter, exhibitor, sponsor or participant.

The Congress Programme: Tuesday 13th June 2017

0830- 0900	**Registration and welcome coffee, Woodbury Park Hotel,**
0900-0905	**Welcome by Dr Knezevic, Founder & President of the MIRCE Akademy**
0900 -1300 **Coffee Break 10.30-11.00**	**Key Note Address: Alex Mulholland BSc, CEng MIET HFMA** *Leonardo MW, Airborne & Space Systems Division* **The shape of things to come: A look at the different ways we approach predicting in-service reliability of new equipment.** For many years military programmes have used constant failure rate to model the reliability of the new electronic equipment designs. They re-enforced this constant model by: measuring achieved performance through the number of failures divided by the unit of operation (hour/landing etc.). In parallel, Companies and Customers acknowledged that "predicted" reliability was unlikely to be achieved from day one in service. So, we included a "fudge factor" or perhaps even a reliability growth profile. These profiles, often based on historical performance or "best engineering judgement", are applied to the failure rate prediction to provide a "more realistic indication" of the real in-service reliability. This paper describes the surprising differences I found in the financial or operational risks we accept by trying to "fudge" a constant failure rate model to address the reality of how the different identifiable and definable failure mechanisms will contribute to the "real" failure profile of new equipment, according to Mirce-mechanics theory.
1300 -1400	**Lunch**
14.00-16.30 **Tea Break 15.15-15.45**	**Dr J. Knezevic, MIRCE Akademy, Exeter, UK** **Accurate Predictions of In-service Cost of Maintainable Systems** For many years engineering programmes, across all industries, have used constant failure rate to estimate in-service costs of maintainable systems. Experience teaches us that those predictions have been proven incorrect, which caused huge discrepancies between predicted and recorded costs. Among subject experts there is no-confirmed, but accepted, understanding that the most accurate predictions in the past was incorrect by 200% and the least accurate by 4000%! Hence, the inaccurate cost predictions were not results of errors in cost analysts, but the inaccurate demands for operational and maintenance resources that have been exclusively linked to the incorrect predictions of failure rates of the constituent components. These were not only inaccurate regarding the physical properties and characteristics of components themselves but totally disregarded independent environmental and human impacts, like ”cosmic radiation, bird strike”, maintenance induced failures, transport damage, and a “million” other observed phenomena. **Mirce-mechanics enables accurate predictions of in-service cost.**
1645-17.00	
17.15-18.15	**2017 Richard F.W. Bader Memorial Lecture** **Atoms and Molecules in Mirce-mechanics** Dr Jezdimir Knezevic, MIRCE Akademy
1900-2200	**Traditional English Fish & Chips in the Traditional English Pub** XVII Century English Pub, Topsham (5 miles from Woodbury Park, transport provided)

Richard F.W. Bader (1931 – 2012)

BSc (1953) and MSc (1955, McMaster University, Hamilton, Ontario, Canada
PhD (1958) f Massachusetts Institute of Technology (MIT). in USA.
1966-1996, a full Professor, at McMaster University.
1980 Elected a Fellow of the Royal Society of Canada
2010 Elected a Grand Fellow of the MIRCE Akademy, UK

“The goal of a scientist is to uncover new ideas, concepts and tools, practical or theoretical, that extend our understanding of the world around us and enable us to do new things. In chemistry, the theory of Atoms In Molecules (AIM) developed in my laboratory, is being increasingly used by workers in all fields of chemistry and also in solid state physics. Because AIM has increased our understanding of how atoms behave, it is used in many ways - to develop new alloys and new and better drugs, for example. Nothing pleases me more than the knowledge that each year sees an ever increasing use of AIM by other scientists in the pursuit of their own research.” **Thank you Richard, you were an inspiration for all of us, Dr K.**

The Congress Programme: Wednesday 14th June 2017

08.30-09.00	**Registration and welcome coffee, Woodbury Park Hotel**
09.00-13.00 **Coffee Break 10.30-11.00**	**Mathematical Mirce-mechanics** **Key Note: Modelling the Motion of Maintainable System Type through Mirce-Space,** John Thompson, Science fellow of the MIRCE Akademy, Exeter, UK The presentation covers the modelling scheme that addresses the motion of maintainable system type through Mirce-space resulting from the transition of its consisting components between positive and negative functionability states. System functionability states are function of the configuration of consisting components. For example, maintainable system type with active redundancy of components will stay in positive functionability state (externally) while some of the components fail, but the system is in a different internal state to when all components are functioning. The scheme presented addresses every possible combination of component functionability states, in accordance to the truth table. Each entry in the truth table is given a unique code – the system functionability state code. Based on the system functionability diagram, the system functionability state codes that cause the failure of the system are identified. Then the cumulative times spend in each system state are calculated, ehich represents the foundation of the prediction of the functionability performance of the given maintainable system type. In conclusion of th presentation the recommendations are made for the rules to be defined the component maintenance policy have to be defined. For example it has to be decided whether components in active redundancy, can or cannot be be repaired while the system is still active and which component failure will cause the system to change functionability state., These rule are need so the time at risk ,run time, of all the components/system can be computed.
13.00-14.00	**Lunch Break**
14.00-17.00 **Coffee Break 15.15-15.45**	***Mirce Profitability Equation,*** Dr knezevic, the MIIRCE Akademy, Exeter, UK Mirce-mechanics philosophy is based on premises that the "purpose of existence" of maintainable system is the delivery of a positive functionability work, which is associated with necessary resources like personnel, material, faculties, energy and so forth. Monetary value of resources consumed constitutes positive functionability cost. Complementary, negative functionability work is done while a system is being in negative functionability state, exposed to positive functionability actions, execution of which are associated with necessary resources like personnel, spare parts, material, tools, equipment, faculties, data, energy and so forth. Monetary value of resources consumed constitutes negative functionability cost (see the last presentation on 13th June o fthe Congress). The main business of business is to stay in business. To stay in business the expected "business function" must be provided through time at minimum investment in resources. Hence, the generated profit, PRF, is equal to the revenue, REV, generated by the monetary value of the "business function", minus the cost of the resources used to run the business,CST, thus *PRF=REV-CST.* Author has been surprised for many years that the profit, as considered by economists, is not treated as the rime dependent variable. In the case of Mirce-mechanics, all predictions must be related to the length of time considered. Thus, the profit, PRF(T), in Mirce-mechanics is equal to the difference between the Revenue,, REV(T) and the Total Functionability Cost, during the stated period of calendar time, TFC(T), expressed in appropriate monetary units, [MU]. Thus the Mirce Profitability equations is formulated by the following mathematical expression: $$PRF(t) = REV(T) - TFC(T) = \left[HI \times PFW(T)\right] - \left[CPW(T) + CNW(T)\right], \quad [MU]$$ Best to the author's knowledge the above equation is the only one that unifies all aspects of in-service performance of a maintainable system type. It enables the accurate predictions of the expected profit to be made for each: design configuration, operational scenario, maintenance policy and support strategy. The above equation "unites" all the elements of in-service operation of a maintainable system type, which is a huge advantage on the current practices that consist of a large number of self-standing models each addressing a few aspects of in-service elements at the time, or a few performance parameters of the system only.
19.00-22.30	**Sherry Reception** **Gala Dinner – 6th Congress of Mirce Mechanics** **The MIRCE Akademy Fellowship Awards Ceremony** **After Dinner Talk: Simplified Technical English as a Mechanism of the Motion in Mirce-mechanics,** **Orlando Chiarello HFMA, Secondo Mona, Somma Lombardo, Italy**

The Congress Programme: Thursday 15th June 2017

08.30-09.00 — **Registration and welcome coffee, Woodbury Park Hotel**

Science of Mirce-mechanics

09.00-10.30

Infrared Radiation as a Mechanism for Monitoring Functionability State of Maintainable Systems, Austin Dunne SFMA, Director, Infrared Training, Liverpool, UK

Infrared thermography has had the most significant influence on my whole working life! Yet, I still perceive that its use in industry has been quite limited. Numerous companies still lock their cameras away in cupboards instead of maximising the use and potential of the instruments. I would think that my industrial Thermography experience saved many millions of pounds; either by identifying serious electrical faults, monitoring processes and process equipment for bottle necks that reduce production or energy saving surveys focussed on refractory, insulation, steam systems or friction. The potential of the technology has not been unlocked, raising the issue as to why this should be the case. After taking to camera manufacturers, distributors, technicians and engineers I have reached the following conclusions:

- Technology is not used correctly as a condition monitoring tool.
- Lack of knowledge/understanding of the correct operation and use of the equipment.
- Using instruments just for one particular inspection technique.

In this presentation I shall give my recommendations for the better use of available technology for monitoring changes in functionability states of maintainable systems.

10.30-11.00 — **Coffee Break**

11.00-13.00

Quantum Aspects of Monitoring Functionability Phenomena in Mirce-mechanics

Chris Burden SFMA Director Applied engineering Prognostic Science (AePS)

The presentation addresses the condition monitoring process within the holistic environment that consequently explains the necessity for the embracement of the quantum aspects of electromagnetic frequency related functionability phenomena that drive a forensic and prognostic understanding of 'normal' to 'change' functionability state conditions, to ultimately identify decay modes and probability routes of different functionability mechanisms, within Mirce-mechanics.

13.00-14.00 — **Lunch Break**

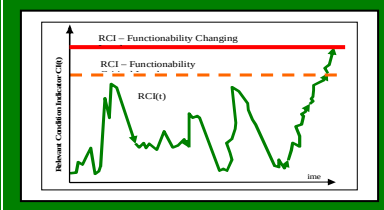
14.00-17.00

Coffee Break 15.15-15.45

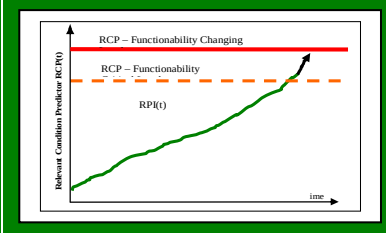
Physical Principles of Functionability Condition Monitoring in Mirce-mechanics

Dr J. Knezevic, MIRCE Akademy, Exeter, UK

Condition monitoring is a process employed to determine the functionability state of maintainable systems. A condition parameter could be any characteristic, which directly or indirectly describes the condition of the system during operating life. Although it is possible to detect several condition parameters, which are connected with the system and its constituent items, only some of them have direct connection with failure mechanisms and therefore ability for describing the condition of the system. In Mirce-mechanics created the concept of the following two types of conditional parameters, which are able to define the functionability state of a component and a system, this:



The Relevant Condition Indicator (RCI) is a monitorable parameter that indicates the condition of the item or system at the instant of checking and thus represents the discrete value of the condition of the item or system at the time of inspection, like the level of vibration, level of oil, measured pressure, recorded temperature and similar.



The Relevant Condition Predictor (RCP) is a monitorable parameter whose numerical value fully describes and quantifies the condition of the system at every instant of operating time". In general, RCP represents the condition of the item, which is affected by degradation failures such as wear, corrosion, fatigue crack growth etc. Typical examples of RCP are wall thickness of pipe, crack length, depth of tyre tread, frictional material left, etc.

Thus, according to Mirce Mechanics, the following two conditional maintenance tasks exist:

a) **Inspection** - a specific conditional maintenance task the result of which is a statement about the condition of the item: go or no-go, which is determined according to the RCI.

b) **Examination** – a specific conditional maintenance task the results of which is a numerical description of the condition of the item at that moment through RCP.

The presentation will focus the applications of these two types of condition characteristics to the process of the motion of maintainable system type through the Mirce-space, and will discuss the possible algorithms for the determination of the frequencies of condition monitoring tasks.

17.00-17.15 — **Closing Remarks and Departure**

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 6th World Congress of Mirce-mechanics.

Service Available	Cost			After 15th May 2017		
All prices are in GB Pounds	Price	VAT	**Total**	Price	VAT	**Total**
Participant for 3 Days	595.00	119.00	**714.00**	645.00	129.00	**774.00**
Participant per Day	225.00	45.00	**270.00**	275.00	55.00	**330.00**
Presenter on the day of presentation	**Free**			**Free**		
Presenter for 3 Days	300.00	60.00	**360.00**	325.00	65.00	**390.00**
Retired participants for 3 Days	195.00	39.00	**234.00**	195.00	39.00	**234.00**
University students for 3 Days	395.00	79.00	**474.00**	495.00	99.00	**594.00**
Congress Proceedings on CD	175.00	35.00	**210.00**	175.00	35.00	**210.00**
MIRCE Akademy Members	550.00	110.00	**660.00**	575.00	115.00	**690.00**
MIRCE Akademy Fellows	575.00	115.00	**690.00**	595.00	119.00	**714.00**
MIRCE Akademy Students	495.00	99.00	**594.00**	525.00	105.00	**630.00**
Partners Programme for 3 Days	195.00	39.00	**234.00**	195.00	39.00	**234.00**
Congress Dinner only	62.50	12.50	**75.00**	62.50	12.50	**75.00**
Sherry, 3 course meal & wine						
Exhibitors - Gold Package	5000.00	1000.00	**6000.00**	5500.00	1100.00	**6600.00**
Exhibitors - Silver Package	3000.00	600.00	**3600.00**	3000.00	600.00	**3600.00**
Exhibitors - Bronze Package	1500.00	300.00	**1800.00**	1500.00	300.00	**1800.00**
B&B at Woodbury Park Hotel - single	**Rooms are**		**75.00**	**Rooms are**		**75.00**
B&B at Woodbury Park Hotel - double	**guaranteed**		**95.00**	**guaranteed**		**95.00**

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.

Terms and Conditions

Substitution of participants may be made at any time. If you intend to do this, please advise the MIRCE Akademy ('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 Congress. The MIRCE Akademy regrets that no refunds or credits will be made after the deadline unless the organiser cancels the Congress. The organiser reserves the right to alter the programme or cancel the Congress at its discretion. All places offered are subject to availability.

For any other information please contact us:

Phone; + 44 (0)1395 233 856,
Email: quest@mirceakademy.com
Website: www.mirceakademy.com

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, Exeter, EX5 1JJ , UK
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🖷 **+44 (0) 1395 233 384**
💻 **enquiries@woodburypark.co.uk**
💻 **www.woodburypark.co.uk**

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.

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

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BOOKING FORM

Email: quest@mirceakademy.com
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Mail: MIRCE Akademy, Woodbury Park, Woodbury, Exeter, EX5 1JJ, United Kingdom
Web site: 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
- Congress Papers and Supporting Materials
- Lunches and Light Refreshments
- Gala Dinner on 14th June
- Richard Bader Memorial Lecture
- Fish & Chips Event on 13th June

Value Added Tax (VAT)

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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 _____

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Postcode _____ Country _____

Tel _____ Fax _____

E-mail _____

Special requirements Yes No

Please specify

I understand and accept the registration terms and conditions as shown

Signature _____ Date _____

Terms and Conditions

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