

23rd MIRCE International Symposium
3 – 5 December 2013, Woodbury Park, Exeter, UK
Functionability Maintenance*

A Tribute to Jack Hessburg (1934-2013) - Grand Fellow of the MIRCE Academy



Jack Hessburg was the first person in the history of aviation tasked to work with the design team to create a maintenance friendly aircraft. In that role he created his own job title – Chief Mechanic. He wrote his own job description – to design flying machines that will be loved by gate mechanics and in doing that, operators and the flying public would also be happy.

His talent, experience and passion for flying exceeded all expectations and today, 18 years later Boeing 777 is still loved by mechanics, as it is easy to fix, adored by the flying public as hardly ever a flight is cancelled and it is well respected by the competitors because of its high level of in-service reliability, safety and functionability.

The Symposium is dedicated to the engineering methods, scientific principles and persuasive management strategies that Jack used during the creation of the maintenance friendly aircraft, which helped him to implement the maintenance philosophy, immortally summarised as:

* *“All I want to do is to go to Cleveland on time and never crash.”*

Tuesday 3rd December 2013

0830- 0900	Registration and welcome coffee, Woodbury Park Hotel,
0900 - 0905	Welcome by Dr Jezdimir Knezevic, Founder & President, Mirce Academy, UK
0905 - 1030	<p><i>System Engineering Trade-off: Functionality vs. Functionability</i></p> <ul style="list-style-type: none"> • Functionality is measured through system function, performance and attributes. All of them are physically measurable deterministic characteristics of a system design. • Functionability is measured through system reliability, availability, effectiveness and cost. All of them are probabilistic characteristics measurable through the system in-service statistics.
1030-1100	Morning Coffee
1100-1200	<p><i>System Reliability Measures – Mirce Mechanics Approach</i></p> <ul style="list-style-type: none"> • <i>System design-in reliability measures (probabilistic)</i> • <i>System in-service reliability measures (statistical)</i> <p>For over 50 years we all have seen deficiencies of the MTBF as the only measure of system reliability but did not have courage to change it, either as producers or as customers and often jointly. The new approach to reliability is here and it will stay with those who are committed to the reliability of their products and systems. .</p>
1200-1300	<p><i>System Availability Measures – Mirce Mechanics Approach</i></p> <ul style="list-style-type: none"> • <i>System design-in availability measures (probabilistic)</i> • <i>System in-service availability measures (statistical)</i> <p>For over 50 years we all have seen deficiencies of time independent A_i and A_o, as the only measures of system availability but did not have courage to change it, either as producers or as customers and often jointly. The new approach to availability is here and it will stay as a necessity of the global competitiveness.</p>
1300 -1400	Lunch
1400 -1530	<p><i>System Effectiveness Measures – Mirce Mechanics Approach</i></p> <ul style="list-style-type: none"> • <i>System design-in measures of effectiveness (probabilistic)</i> • <i>System in-service measures of effectiveness (statistical)</i> <p>For over 50 years we all have seen various measures of system effectiveness that everybody quoted but nobody understood but did not have courage to change it, either as producers or as customers and often jointly. The new approach to system effectiveness is here and it will stay as a necessity of the global competitiveness.</p>
1530-1600	Afternoon Tea
1600 -1730	<p><i>Measures of System Economics – Mirce Mechanics Approach</i></p> <ul style="list-style-type: none"> • <i>Measures of Economic: Profit, Revenue and Cost</i> • <i>System design-in measures of economics (probabilistic)</i> • <i>System in-service measures of economics (statistical)</i> <p>For over 50 years engineering and management community have tried to understand and interpret measures of economics as a system engineering measures unsuccessfully but did not have courage to change it, either as producers or as customers and often jointly. The new approach to System economics is here and it will stay as a necessity of the global competitiveness.</p>
18.15-19.30	<p align="center">MIRCE Academy Annual Lecture</p> <p align="center">“Blue skies: bird magneto-detection and the blue cone receptor“</p> <p align="center">Dr Jennifer Brookes</p> <p>It is extra-ordinary that birds are able to detect the strength and orientation of very weak magnetic fields (200-600 milligauss) especially given humans cope mainly obliviously with ranges of factors from 10-10,000’s times higher, e.g., pacemakers can operate up to 5 gauss, a fridge magnet is 50 gauss and MRI operates at 94 kilogauss. I will discuss the idea that the visual blue cone receptor in the bird’s eye may host a magneto-sensitive mechanism, which may possibly be innate in humans but that birds have specially adapted for their navigational purposes in migration.</p>

Wednesday 4th December 2013

0830- 0900	<p align="center">Registration and welcome coffee, Woodbury Park Hotel,</p>
0900 - 1030	<p><i>Maintainability impact on Equipment Availability and System Functionability</i> The majority of users state that the equipment availability is equally important to them as its safety, because they cannot tolerate having equipment out of operation. According to Hessburg there are several ways that designers can control that. One is to build items/systems that are extremely reliable, and consequently, costly. The second is to provide a system that, when it fails, is easy to restore. Thus, if everything is made highly reliable and everything is easy to repair, the producer has a very efficient system, which no one can afford to buy. Consequently, maintainability is one of the main factors in achieving a high level of operational availability, which in turn increases users or customers satisfaction.</p>
1030-1100	<p align="center">Morning Coffee</p>
1100-1300	<p><i>Accessibility vs. Maintainability</i> According to Hessburg one of the common perceptions is that maintainability is simply the ability to reach a component to change it. However, that is only a small aspect, according to him. Maintainability is actually just one dimension of system design and a system's maintenance management policy. For example it could be required from the designer that only three screws are acceptable on a certain partition panel in order to get speedy access inside. However, this request has to be placed into a larger context and it becomes a trade-off. If the item behind a panel needs only to be checked once in every five-six years, it does not make sense to concentrate much intellectual effort or spend project money on quick access. Thus, a lot of fasteners and connectors could be tolerated and the item may not be quickly accessible, but it has been traded off against the cost and operational effectiveness of the system.</p>
1300 -1400	<p align="center">Lunch</p>
1400-1530	<p><i>Built-In-Test-Equipment (BITE) ns. No Fault Found</i> According to Hessburg good troubleshooting is nothing more than good deductive reasoning. At the centre of that reasoning is a careful collection and evaluation of physical evidence. Unfortunately, many aircraft devices use computer chips to provide a function formerly fulfilled by substantial mechanical parts or subsystems. Consequently, troubleshooting, in the traditional sense of searching for physical evidence of failure, is hindered and no-fault-found increased. You can't troubleshoot a computer chip by looking for physical evidence of failure. A broken chip does not look any different from a healthy one. Although it can be argued that broken chips occasionally make smoke, evidence of malfunction is seldom readily apparent. Broken chips do not leak, vibrate, or make a noise. Bad software within them does not leave puddles or stains as evidence of its misbehaviour. Ones and zeros falling off the end of a connector pin are difficult to see.</p>
1530-1600	<p align="center">Afternoon Tea</p>
1600-1730	<p><i>Education of Design Engineers and Project Managers</i> According to Hessburg part of the Chief Mechanic's job is education. It is his task to make people aware of the environment in which mechanics operate. "It's not that designers are stupid, but they're inexperienced on this side of business. For example, they have to learn that there are different types of maintenance. Anyone can maintain an airplane component or system on the bench. However, the gate environment is very much result and schedule driven. Additionally, design engineers have to be aware of the environment in which maintainers operate. It is much easier to maintain an item on the bench, than at the airport gate, war theatre, busy morning traffic, or any other result-oriented and schedule-driven environment. Thus, the trade off process has to take into account the operational environment and the significance of the consequences if the task is not completed satisfactorily, when the trade off is made.</p>
1900 - 1930	<p align="center">Get Together Sherry Reception at Woodbury Park Golf Hotel</p>
1930-2230	<p align="center"> Symposium Dinner & MIRCE Akademy Members Christmas Dinner Released for Flight – Jack Hessburg, Chief Mechanic (1934-2013) Written Tribute by Gordon McKenzie, United Airlines 777 Program Manager (ret) MIRCE Akademy Fellowship Award </p> <div style="display: flex; justify-content: space-between; align-items: center;"> <div data-bbox="320 1939 539 2145" style="border: 1px solid black; padding: 5px;">  </div> <div data-bbox="563 1939 1465 2145" style="border: 1px solid black; padding: 5px;"> <p>Formula 1 Reliability & Effectiveness Centre, of the MIRCE Akademy Announcement and Award of the</p> <ul style="list-style-type: none"> • 2013 Formula 1 Driver Reliability Champion • 2013 Formula 1 Team Reliability Champion <p>In accordance to the calculations based on the Mirce Mechanics</p> </div> </div>

Thursday 5th December 2013

0830– 0900	<i>Registration and welcome coffee, Woodbury Park Hotel,</i>
0900 – 10.30	<p align="center"><i>Jack Hessburg - My Professional Idol and Personal Friend – Dr J. Knezevic</i></p> <p>My first knowledge of Jack was through the pages of many professional journals and reports on the new way that Boeing was using to develop the 777. Much of that material was cited in my 1996 System Maintainability book. The book was dedicated to Jack and his visionary boss Alan Mulally, although I had never met them. Then in 1997, during the First Aviation Congress that took place in Los Angeles, I had the privilege of meeting them both. That was the day when My Chief Mechanic was created. From that moment to the very last hour of our final encounter, at the end of July 2013 in Seattle, I had many opportunities to learn from Jack and have fun with Jack. This beautiful collaboration “converted” him into my professional idol and personal friend.</p>
10.30 -11.00	Morning coffee
11.00-13.00	<p>Jack’s genius, manifested in his ability to distil the fundamental out of the complex and to present it with unique sense, helped the MIRCE Akademy to understand that the word maintenance has two meanings - the common one that is “<i>fixing broken stuff</i>” and his, which is the “<i>management of failures</i>”. This realization fundamentally shaped our approach to the Management of In-service Reliability, Cost and Effectiveness (MIRCE). Even further, the desire to provide the answer to the Jack’s life long question</p> <p align="center"><i>“What is kilogram of maintenance worth?”</i></p> <p>guided our research for years. Today, methods of Mirce Mechanics are successfully used to quantitatively assess the delicate balance between the cost of designing in <i>economic redundancy</i> and in-service benefit regarding <i>functionability maintenance</i>, for all design alternatives.</p>
1300 – 1345	Lunch
1300-1530	<p>I strongly believe that it is my professional responsibility, and of course a personal privilege, to expose future generations of engineers and managers to the views of My Chief Mechanic, who clearly understood the aircraft is not purchased by airlines because it is as a “<i>Nintendo marvel wrapped in aluminium</i>” but because it enables them to conduct the transportation business by being at the gate on time to originate the trip to the chosen destination, immortally summarised by Jack</p> <p align="center"><i>“What I want to do is to go to Cleveland on time and never crash”</i></p>
1530-1600	Afternoon Tea
1600-1700	<i>Visit to MIRCE Akademy Auto Racing Championship Centre</i>

All prices are in GB Pounds	Before 1st November 2013			After 1st November 2013		
Service	Price	VAT	Total	Price	VAT	Total
Participant for 3 Days	495.00	99.00	594.00	545.00	109.00	654.00
Participant per Day	195.00	39.00	234.00	215.00	43.00	258.00
Presenter on the day of presentation	Free			Free		
Presenter for 3 Days	295.00	59.00	354.00	325.00	65.00	390.00
Retired participants for 3 Days	175.00	35.00	210.00	195.00	39.00	234.00
University students for 3 Day	375.00	75.00	450.00	395.00	79.00	474.00
Congress Proceedings on CD	150.00	30.00	180.00	175.00	35.00	210.00
MIRCE Akademy Members	450.00	90.00	540.00	495.00	99.00	594.00
MIRCE Akademy Fellows	475.00	95.00	570.00	505.00	101.00	606.00
MIRCE Akademy Students	275.00	55.00	330.00	295.00	59.00	354.00
Partners Programme for 3 Days	125.00	25.00	150.00	145.00	29.00	174.00
Symposium Dinner only	60.00	12.00	72.00	65.00	13.00	78.00
B&B at Woodbury Park Hotel - single	Room is		75.00	Room is		75.00
B&B at Woodbury Park Hotel - double	guaranteed		95.00	not guaranteed		95.00

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.

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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 phenomena through the life of 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

23rd MIRCE International Symposium

Functionability Maintenance: 3 - 5 December 2013

Registration Form

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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 4th 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.

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Special requirements Yes No

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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.