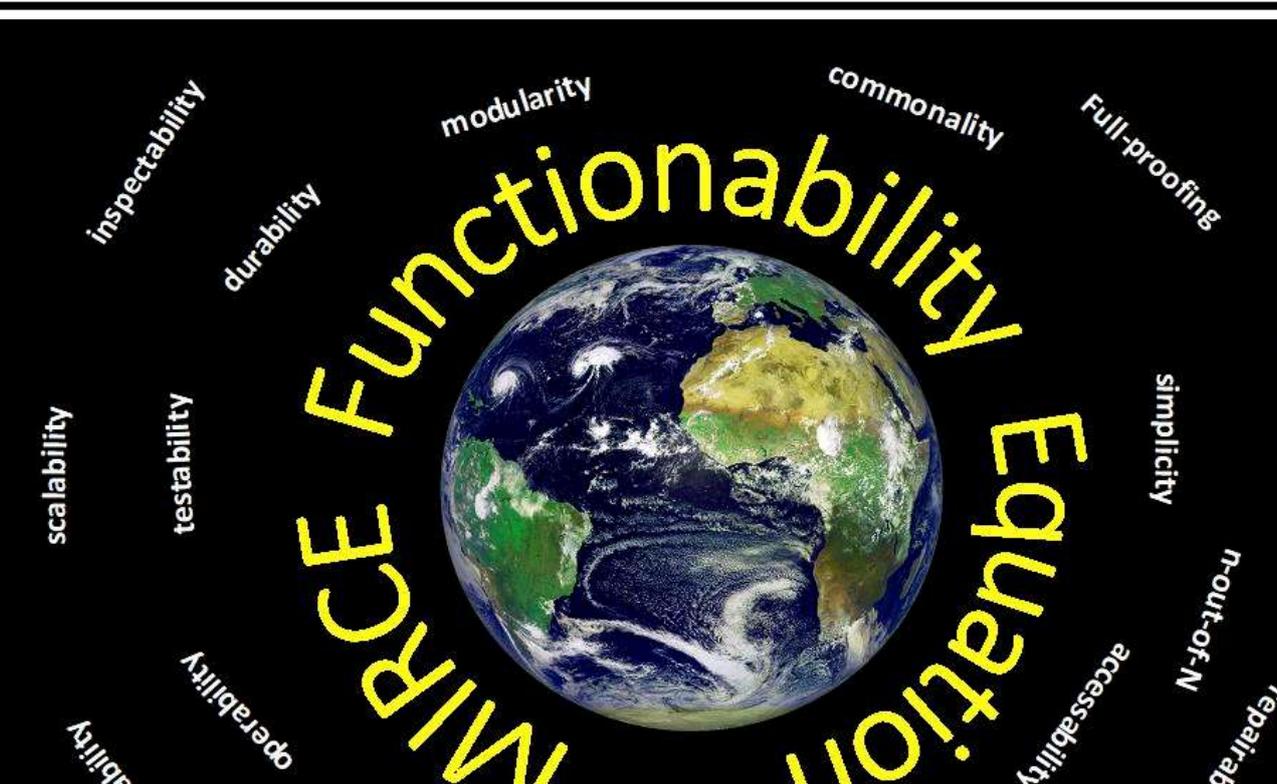


33rd MIRCE International Symposium
6 - 7 December 2023, Woodbury Park, Exeter, UK



The graphic features a central image of the Earth. Surrounding it is the text "MIRCE Functionability Equation" in a large, yellow, sans-serif font. The words "MIRCE" and "Equation" are on the left and right respectively, while "Functionability" is at the top. Various terms are arranged around the Earth, including: inspectability, durability, modularity, commonality, Full-proofing, standardisation, simplicity, n-out-of-N, reparability, accessibility, operability, testability, scalability, and serviceability.

33rd MIRCE International Symposium
6 - 7 December 2023, Woodbury Park, Exeter, UK

MIRCE Science: Spacecraft Functionability

“Isn’t it strange that when satellites run out of fuel or a single component breaks down, we just discard them?” ESA, 14.07.2023

“Now is the time to leave behind this ill conceived approach towards design, use and abundance of thousands of spacecraft that now constitute Orbital Debris. Thus, it is an imperative to move from a design for functionality only, to designing-in functionability, the ability to facilitate execution of in-orbit positive functionability actions, which will extend their lives and even enable their safe disposals. MIRCE Science, a theory of a motion of working system through MIRCE Space, resulting from any actions whatsoever, is created at the MIRCE Akademy, for that purpose.”

Dr Knezevic, Founder & President of MIRCE Akademy

The Symposium Programme at Glance

>>>>> Wednesday 6th December 2023 <<<<<

0830-0900	Registration and welcome coffee, Colin Chapman, Room, Woodbury Park Hotel
0900-1300	<p>Spacecraft - From Functionality to Orbital Debris, Mr L. Jeftic, Science Fellow MIRCE Akademy, Exeter, UK</p> <p>Spacecraft can be defined as vehicles, payloads, and other human created objects that are designed to for placement or operation in outer space. For example, spacecraft include satellites, inhabitable space stations, inhabitable capsules, and cargo vehicles. The space environment is understood to contain all man made objects, including fragments and elements thereof, which currently or previously did, reside in an Earth bound orbit. To build spacecraft that will survive the harsh space environment, it is essential to understand in-service hazards they are going to face. Thus,</p> <ul style="list-style-type: none"> - The gravitational environment causes some physiological and fluid containment problems, but also provides opportunities for manufacturing - Earth's atmosphere affects a spacecraft, even in orbit - The vacuum in space above the atmosphere gives spacecraft another challenge - Natural and human made objects in space pose collision hazards - Radiation and charged particles from the Sun and the rest of the universe can severely damage unprotected spacecraft. <p>There are several aspects of the space environment that affects the spacecraft functionality. These are: vacuum (outgassing), atomic oxygen, atmospheric drag, solar ultraviolet (UV) radiation, charged particle (ionizing) radiation, plasma, spacecraft charging and arcing, temperature extremes, thermal cycling, impacts from micrometeoroids and orbital debris (MMOD). Space environmental threats to spacecraft components vary greatly, based on the component materials, thicknesses and stress levels. Also to be considered are the mission duration and the specific mission environment, including orbital parameters for the mission, the solar cycle and solar events, view angle of spacecraft surfaces to the sun and orientation of spacecraft surfaces with respect to the spacecraft velocity vector in LEO.</p>
1030-1100 Coffee	
1300-1400	Lunch Break
1400-1730	<p>Fundamentals of MIRCE Science, Dr J. Knezevic, MIRCE Akademy, Exeter, UK</p> <p>The philosophy of MIRCE Science is based on the premise that the purpose of existence of any working system is to do a work. The work is done when, at least one, measurable function is performed through time. However, experience teaches us that expected work is frequently beset by undesirable negative functionability events, resulting from a variety of negative functionability actions that prevent work to be done. Consequently, positive functionability actions must be performed on the systems to enable them to continue doing the expected work. Thus, MIRCE science is a theory of the motion of working systems through MIRCE Space, resulting from any actions whatsoever. (www.mirceakademy.com)</p> <p>MIRCE Functionability Equation, Dr J. Knezevic, MIRCE Akademy, Exeter, UK</p> <p>The complex, time dependent, flow of positive and negative functionability actions determine functionability performance of a working system and resources consumed, which regrettably become known only at the end of a financial year or after the disposal, when nothing could be done to influence it. By studying mechanisms of all impacting actions MIRCE Science theory is able to predict those interactions and predict expected functionability performance work and associated resources required for each of feasible options, by making use of MIRCE Functionability Equation in accordance to corresponding axioms, rules and methods.</p>
1530-1600 Tea	
18.30-19.00	Book signing and group photo
1900-1930	Get Together Sherry Reception at Woodbury Park Hotel
1930-2230	<p>Symposium Dinner & MIRCE Akademy Members Christmas Dinner</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>Functionability 1 - Research & Education Centre, of the MIRCE Akademy</p> <p>MIRCE Science based Announcement and Award of the:</p> <ul style="list-style-type: none"> • 2023 Formula 1 Driver Functionability Champion • 2023 Formula 1 Team Functionability Champion </div> </div>

0900-1300

Spacecraft Operability, Dr J. Knezevic, MIRCE Akademy, Exeter, UK

According to MIRCE Science operability is defined as, “a design-in suitability of a working system type to be retained in positive functionality state while performing the required operational tasks with required resources.” MIRCE Operability Equation is used to quantitatively predict the consequences of each feasible operation related design decision on system functionality performances in the manner presented in this session, which focuses on spacecraft related examples and potential applications .

Spacecraft Maintainability, Dr J. Knezevic, MIRCE Akademy, Exeter, UK

According to MIRCE Science, maintainability is defined as, “a design-in suitability of a working system type to be returned to a positive functionality state by performing the required positive functionality actions with required resources.” MIRCE Maintainability Equation is used to quantitatively predict the consequences of each feasible maintenance related design decision on system functionality performances in the manner presented in this session, which focuses on spacecraft related examples and potential applications.

Spacecraft Supportability, Dr J. Knezevic, MIRCE Akademy, Exeter, UK

According to MIRCE Science, supportability is defined as, “a design-in suitability of a working system type to be provided by required resources for execution of required positive and negative functionality actions.” MIRCE Supportability Equation is used to quantitatively predict the consequences of each feasible support related design decision on system functionality performances in the manner presented in this session, which focuses on spacecraft related examples and potential applications.

1030-1100
Coffee

1300-1400

Lunch Break

1400-1700

Designing-in Spacecraft Functionability, Dr J. Knezevic, MIRCE Akademy, Exeter, UK

The closing session will demonstrate the applicability of MIRCE Science to the designing-in functionability into spacecraft. It enables quantitative assessment of the combined impact of engineering design and in-service management decisions on the functionability performance of a future spacecraft. For the purpose of this exercise the spacecraft considered could be deployed in one of the following four options, namely:

- **Option 1:** The satellite under consideration is expected to experience an in-orbit negative functionability event during a continuous operation with the expected frequency of X hours. This design option does not provide any opportunity for the execution of any positive functionability action whatsoever, ever!
- **Option 2:** What would be the benefit if the satellite under consideration is designed in the way that in-orbit, positive functionability actions could be performed when needed, assuming that the action is expected to take Y hours?
- **Option 3:** After further analysis of the satellite considered the production department submitted a proposal in which they were stating that by investing the additional funds allocated into a new technology it would be possible to extend the original design expected frequency of occurrences of in-orbit negative functionability events will be extended by 50%?
- **Option 4:** After further analysis of the satellite considered the in-orbit servicing department concluded that the same additional fund invested in new testing and diagnostic technology would reduce the time spend in-orbit servicing action by 50%, in respect to the original design solution.

Fundamental question: Which option should be adopted for in-orbit deployment of the system under consideration given that the maximum positive work done during a stated period of use Z, is decision making criteria? **MIRCE Science answer will be given at 16.45 !**

1500-1530
Tea

1700-17.30

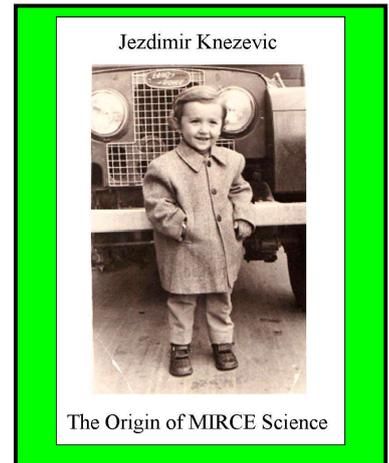
Book signing and group photo



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 misericords, 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.

All prices are in GB Pounds	6 - 7 December 2023		
Service	Price	VAT	Total
Participant	795.00	159.00	954.00
Retired participants	495.00	99.00	594.00
University students	375.00	75.00	450.00
MIRCE Akademy Members	575.00	115.00	690.00
MIRCE Akademy Fellows	495.00	99.00	594.00
MIRCE Akademy Students	275.00	55.00	330.00
Symposium Dinner only (please tell us dietary requirements)	100.00	20.00	120.00



Special Christmas present to each paid participant from the MIRCE Akademy

A signed copy of the book “**The Origin of MIRCE Science**”, by J. Knezevic, published by MIRCE Science 232 pages, published in 2017. . [http://www.mirceakademy.com/uploads/JK-A4-MSc-BOOK\(3\).pdf](http://www.mirceakademy.com/uploads/JK-A4-MSc-BOOK(3).pdf)
 Physical and mathematical reality of a motion of a working system through MIRCE Space are fully analysed, and presented through a set of original axioms and MIRCE Functionability Formulas. They deal with all operational, maintenance and support processes, actions and events in an integrated way that it become possible to predict expected work and resources required for all feasible options.



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

☎ +44 (0) 1392 874 382

☎ +44 (0) 1395 233 382 (Hotel)

✉ enquiries@woodburypark.co.uk

□ 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 Science – study of mechanisms of the motion of a functional system through MIRCE Space to determine resources required for delivering expected work.

The knowledge and methods of MIRCE Science 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 a scientific based knowledge are experienced through significant increase in system effectiveness while drastically reducing costs of making, running and disposing systems.



Phone: + 44 (0) 1392 874 318 Email: office@mirceakademy.com Web: www.mirceakademy.com



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

33rd MIRCE International Symposium: 6 - 7 December 2023

MIRCE Science: Spacecraft Functionability

Registration Form

Email: office@mirceakademy.com

Phone: +44 (0) 1392 874 318

Mail: MIRCE Akademy, Woodbury Park, 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
- Symposium Material and Supporting Materials
- Lunch and Light Refreshments
- Book "The Origin of MIRCE Science"
- Christmas Dinner
- Free Parking

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 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.

Invoice with payment details will be emailed to a participant after receiving the booking form electronically or by mail.

PERSONAL DETAILS (Please print clearly)

Surname _____

First name _____

Organisation _____

Department _____

Position _____

Address _____

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 _____