

Directed Energy Weapons 2010

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25 – 26 March 2010 | Pre-Conference Workshops: 24 March 2010 | CCT, Canary Wharf, London

Exclusive briefings delivering insights into:

- European and NATO perspectives into operational and technical aspects of Directed Energy from NATO and European Working Groups
- Technical briefings on optical systems and their effects on ammunitions, both in aerial countermeasure application and as counter-IEDs from leading European and American scientists
- Detailed briefings on US, Czech, Danish and Chinese DE programmes, including contributions from US Army Space and Missile Defense Command and the US Marine Corps
- Latest insights into both European and US programmes, with high power fibre lasers, explosive pulsed power, solid state lasers and acoustic power all on the agenda
- Analyses of laser safety and HPM threat to infrastructure, provided by UK MoD and QinetiQ
- Comprehensive examination of Directed Energy and its role in Electronic Warfare

Featuring high-level briefings from:

-  **Major General (ret'd) George Harrison**, Director, Strategic Initiatives, *Georgia Technology Research Institute*
-  **Dr Larry Altgilbers**, Senior Engineer, Explosive Pulsed Power Programme, *US Army Space and Missile Defense Command*
-  **Dr Ernst Krogager**, Senior Scientist, Applied Research Branch, *Danish Defence and Logistics Organisation / Chairman, NATO Working Group for HPM*
-  **Scott McPheeters**, Senior Advisor, Chief Engineers Office, *US PEO Missiles and Space*
-  **Wing Commander (ret'd) John Clifford**, Director, *JMC Defence Ltd*
-  **Captain Massimo Annati**, *Italian Navy* and Deputy Director, *European Working Group on Non-Lethal Weapons*
-  **Major Robb 'Thor' Mansfield**, Aircraft Survivability Equipment and Directed Energy Requirements Officer, *US Marine Corps*
-  **Dr Ruediger Schmitt**, Senior Scientist, Laser Applications, *French-German Research Institute, ISL*
-  **Dr Mårten Risling**, Experimental Trauma Unit, *Karolinska Institutet and European / EDA / NATO working groups on HPM*
-  **Dr Wilhelm Eckl**, Head of Energetic Systems, *Fraunhofer ICT, Germany*
-  **Matthew Flower**, Head of Laser Safety, Military Laser Safety Committee (MLSC), *UK MoD*
-  **Dr Richard Hoad**, Consultancy Capability Group Leader, Electromagnetic and Environmental Services, *QinetiQ*
-  **Dr Mike Cathcart**, Director, Remote Sensors Group, *Georgia Technology Research Institute*
-  **Dr Nicholas Nicholas**, Senior Research Associate and Lead Scientist for the Institute for Non-Lethal Defense Technologies, *Penn State University*
-  **Dr John Swegle**, Senior Advisory Scientist, *Savannah River National Laboratory*
-  **Dr. Michael Von Salisch**, Senior Scientist, Special Laser Applications, *French-German Research Institute, ISL*
-  **Dr Peter Sapaty**, Simulation and Control Academy, *National Academy of Sciences, Ukraine*
-  **Dr Libor Palisek**, Chief Researcher, *VOP-026 Sternberk, Czech Republic*
-  **Dr Dan Vela**, EMC Research Scientist, *VOP-026 Sternberk, Czech Republic*

Pre-Conference Workshops | 24th March 2010

A – 10.00 - 13.00
Understanding and Evaluating High-Power Microwave Sources and Systems

Led by: **John Swegle**, Senior Advisory Scientist, *Savannah River National Laboratory*

B – 13.30 - 16.30
Issues and Challenges Relating to the Operation and Application of Directed Energy Systems

Led by: **Dr. Michael Cathcart**, Chief Remote Sensing Group, Principal Research Scientist, *Georgia Technology Research Institute*

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Directed Energy

PRE-CONFERENCE WORKSHOPS 24th March 2010

A – 10.00-13.00 UNDERSTANDING AND EVALUATING HIGH-POWER MICROWAVE SOURCES AND SYSTEMS

Led by: Dr. John Swegle, Senior Advisory Scientist, *Savannah River National Laboratory*

The field of high-power microwaves is roughly divided into high-peak-power and high-average-power systems. High-peak-power systems are capable of producing pulses of 100 ns or more at gigawatt power levels across the microwave band from 1-10 GHz and up into the millimeter-wave frequency regime.

High-average-power systems, on the other hand, operate at powers of hundreds of kW for durations that may extend from seconds to cw. The microwave sources are a key technology in both regimes.

This course will be aimed at developing an understanding of these systems and choices for newcomers and at expanding the intuitive grasp of the more experienced technologist.

Discussions will examine several key topic areas including:

- Review of the available technology for realising HPM systems
- Setting requirements and scoping HPM systems
- Alternative paths for building an HPM system
- Evaluating the tradeoffs in capability, size, and mass

B – 13.30-16.30 ISSUES AND CHALLENGES RELATING THE OPERATION AND APPLICATION OF DIRECTED ENERGY SYSTEMS

Led by: Dr. Michael Cathcart, Chief Remote Sensing Group, Principal Research Scientist, *Georgia Technology Research Institute*

Advances in directed energy technologies have made the operational deployment of directed energy a reality. These unconventional weapon and countermeasure systems bring both unique capabilities and challenges to the battlefield and require a new standard of thinking. The technical advantages of directed energy systems are well documented but issues related to DE deployment and operation less so. An understanding of these issues is critical to the successful deployment and application of these systems on the battlefield. These matters cover a range of areas including component technologies, materiel support, engagement tactics, and safety.

This workshop will help you understand the various issues associated with the deployment of directed energy systems including:

- Target engagement tactics
- Concept of operations
- Collateral damage
- Logistics
- Maintenance
- Training

DAY ONE 25th March 2010

08.30 Coffee & Registration

09.00 Chairman's Welcome & Introduction

09.10 Space Missile Defence Command and Explosive Pulsed Power

- Technical outline of concept
- Current and potential applications
- Future development

Dr Larry Altgilbers, Senior Engineer, Explosive Pulsed Power Programme, *US Army Space and Missile Defense Command*

09.50 Operational Considerations of Directed Energy Weapons

- Operators need specific, detailed parameters before employing DE weapons
- Gaps between the laboratory and the operator including effects, assessment, training, doctrine and documentation
- Appropriately conservative operators will not use DE until the gaps are filled

Major General (ret'd) George Harrison, Director, Strategic Initiatives, *Georgia Technology Research Institute* and former Commander, Air Force Operational Test and Evaluation Center, Kirtland Air Force Base, New Mexico.

10.30 Morning Coffee Break

11.00 Non-Lethal Capabilities in Maritime Security

- Need for non-lethal alternatives in maritime scenarios (AT-FP, VBSS-Interdiction, law enforcement and constabulary)
- Intent discrimination through the use of Non-Lethal Capabilities
- Technical and operational specificities of NLW maritime applications
- Main national programmes and developments (US and Europe)

Captain Massimo Annati, *Italian Navy* and Deputy Director, *European Working Group for Non-Lethal Weapons*

11.40 Danish Perspective on HPM Research

- National research under the NATO umbrella
- From generic targets to operational relevance
- Threat to infrastructure and military equipment
- Susceptibility of electronic equipment, including IED
- Network based operations and software defined radio in HPM environment

Dr Ernst Krogager, Senior Scientist, *Danish Defence Acquisition and Logistics Organisation / Chairman NATO Working Group on HPM*

12.20 Networking Lunch

13.30 Non-Lethal Weapons in the Directed Energy Sphere

- Physical theory behind electro-magnetic weapons
- Use of EM weapons as countermeasures

Dr Wilhelm Eckl, Head of Energetic Systems, *Fraunhofer ICT, Germany*

14.10 Physics of Laser Interaction in Military and Homeland Security Applications

- Linear and non-linear energy coupling
- Countermeasure against optronical components
- Laser effects on ammunitions

Dr Ruediger Schmitt, Senior Scientist, Laser Applications, *French-German Research Institute, ISL*

14.50 Afternoon Coffee Break

Focus on Directed Energy and Electronic Warfare Concepts for Future Warfare

- Lessons from warfare in the 21st Century.
- The role of Concepts in driving change.
- Electromagnetic Operational Environment - the future of DE and EW

Wing Commander (ret'd) John Clifford OBE, Director, *JMC Defence Ltd*

16.00 DE in the EW domain

- Introduction to specifics
- Weaponisation of the EM domain
- Future of EM domain and Directed Energy

Scott McPheeters, Senior Advisor, Chief Engineers Office, *US PEO Missiles and Space*

16.40 HA Review of Chinese HPM Technology

- Outline of Chinese scope and interests in HPM
- Progress of HPM technology in China
- Military applications of HPM in China

Dr John Swegle, Senior Advisory Scientist, *Savannah River National Laboratory, USA*

17.20 Chairman's Summary and End of Day One

4 Weapons 2010

DAY TWO 26th March 2010

08.30 Coffee & Registration

09.00 Chairman's Welcome

09.10 High Energy Laser Weapons on U.S. Navy and Marine Corps Tactical and Assault Aircraft

- Capability requirements for speed-of-light weaponry in future warfare scenarios (Offensive and Defensive)
- Naval Aviation interest in Directed Energy Weapons
- Engineering challenges
- Realistic employment (roles and missions)
- The road ahead

Major Robb "Thor" Mansfield, Aircraft Survivability Equipment and Directed Energy Requirements Officer, **US Marine Corps**

09.50 Evaluation of Non-Lethal Systems

- Applicability of systems
- Performance analysis of DE
- Risk assessment of NL systems

Dr Mike Cathcart, Director of Remote Sensing Group, **Georgia Technology Research Institute**

10.30 Networking Coffee Break

11.00 High Powered Microwaves (HPM) and Human Trauma

- Differences between pulsed and non-pulsed electromagnetic fields - thermal heating and security guidelines
- The relation between NATO STANAG and civilian guidelines
- Work within NATO and EDA on how to evaluate possible effects of pulsed electromagnetic fields
- Experimental work with cell cultures and animals versus computer modelling

Dr Marten Risling, Experimental Trauma Unit, **Karolinska Institutet**, member of **European / EDA / NATO working groups**

11.40 Special Solid-State Lasers for Protection of Airborne Platforms by Jamming And Damage

- Threat description according to jamming and damage lasers
- Comparison of well known "classical" military lasers with small-scale solid-state lasers and their adaptation to airborne platforms
- Different concepts of solid-state laser in the 2 μm range for jamming and damage treated by ISL

Dr Michael H von Salisch, Senior Scientist, Special Laser Applications, **French-German Research Institute, ISL**

12.20 Networking Lunch

13.30 Acoustic Energy in the the Field of Directed Energy

- Current capability of Acoustic DE weapons
- Integration within other DE platforms
- Application of acoustic systems

Dr Nicholas Nicholas, Senior Research Associate and Lead Scientist, Institute for Non-Lethal Defense Technologies, **Penn State University**

14.10 VOP Briefing on HPM and Ultra-Wide Bandwidth Impact on Electronic Equipment

- Outline of current projects
- Impact of HPM and UWB on military electrics and possible immunities
- Test results and conclusions

Dr Libor Palisek, Chief Researcher, and **Dr Dan Vela**, EMC Research Scientist, **VOP-26 Sternberk, Czech Republic**

14.50 Afternoon Coffee Break

15.20 Protection from High Power Electromagnetic (HPEM) Environments on Civil Infrastructure

- Summary of relevant published environment and effects data
- An overview of civil protection standards for HPEM
- An overview of protection measures

Dr Richard Hoad, Consultancy Capability Group Leader, **Electromagnetic and Environmental Services, QinetiQ**

16.00 Laser Safety and Directed Energy

- Impact of HE laser systems on safe training
 - Issues with operational use with high energy lasers
- Matthew Flower**, Head of Laser Safety, Military Laser Safety Committee (MLSC), **UK MoD**

16.40 High-level Organisation and Management of Directed Energy Systems

- Advanced scenarios using DE – from battlefield to infrastructure protection and crisis management
- Global awareness and decision making with the "speed of light": Flexible automatic command and control for DEW-related systems
- Unified Integration of Unmanned Systems and Sensor Networks with DEW; distributed tracking of mobile targets

Dr Peter Sapaty, Distributed Simulation and Control, Academy, **National Academy of Sciences, Ukraine**

17.20 Chairman's Summary and End of Day One

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What delegates have said about previous Directed Energy Weapons conferences:

Excellent, much more technical content than expected!

Jacques Dubois, Defence R&D Canada-Valcartier

A useful conference, well pitched & well presented. Very useful for my current position and my future posts; I'll be back

Richie Judson, RAF AWC



DIRECTED ENERGY WEAPONS 2010

CCT Canary Wharf, London

Main Two-Day Conference:

25th and 26th March 2010

Pre-Conference Workshops:

24th March 2010

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 B) Operational Issues Relating To The Deployment of Directed Energy Weapons

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