

Directed Energy Weapons 2011

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PREPARING DIRECTED ENERGY FOR THE BATTLEFIELD

DATE: 23rd-24th February 2011

LOCATION: CCT Smithfield, London

PRE-CONFERENCE WORKSHOPS: 22nd February 2011

EXCLUSIVE BRIEFINGS DELIVERING INSIGHTS INTO:

- Exclusive briefing from the Russian Academy of Sciences on the latest High Powered Microwave electronics research being conducted in Russia
- Advances surrounding electronic and cyber system vulnerability to HPM, and what countermeasures can be put in place to protect your assets
- Assessments by the US Air Combat Centre and Netherlands TNO on the future of DEW in military operations, and apply their findings to your projects
- Learn the latest from military DEW projects, including the US Active Denial System and Italian MoD Directed Energy STOpper (DESTO), to keep you at the forefront of next generation weapon development
- Gain insights into the latest technical developments from research organisations around the world, including work being done into power generation, switching and storage, solid state lasers, high powered fibre lasers and microwave pulse energy
- Hear the latest on DEW bio-effects and safety considerations from the UK MoD, US DoD and Karolinska Institutet

PRE CONFERENCE WORKSHOPS: 22ND FEBRUARY 2011

- A 08:30-11:30 State of the Art in High-Power Microwave Systems: Today and Tomorrow**
Led by: Dr John Swegle, Senior Advisory Scientist, Savannah River National Laboratory
- B 11:45-14:45 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
- C 15:00-18:00 Directed Energy Hazards to Civil Aviation**
Led by: Ms Yael Shahar, Director, Database Project Institute for Counter Terrorism

2011 SPEAKERS INCLUDE:

-  **Chairman Dr Chris Pell**, Chairman of UK DEW Special Interest Group and an Independent Member of **MoD's Defence Scientific Advisory Council**
-  **Col Joseph Skaja**, Chief of Electronic Warfare, Information Operations and Directed Energy Division, **Air Combat Centre**
-  **Maj Gen (ret'd) George Harrison**, Director, Strategic Initiatives, **Georgia Technology Research Institute**
-  **Capt Massimo Annati**, Italian Navy and Deputy Director of the **European Working Group on Non-Lethal Weapons**
-  **Professor Gennady Mesyats**, Vice-President, **Russian Academy of Sciences**
-  **Mark Neice**, Director, High Energy Laser Joint Technology Office, **US DoD**
-  **Dr Prasad Akkapeddi**, US Army Asymmetric Warfare Office, Threats and Solutions Division, **US DoD**
-  **Peter Prodzenko**, US Army Asymmetric Warfare Office, Threats and Solutions Division, **US DoD**
-  **Avi Schnurr**, Executive Director, **Israeli Missile Defence Association** – Founder and Director of **Tactical High Energy Laser Program**
-  **Matthew Flower**, Head of Laser Safety, Military Laser Safety Committee (MLSC), **UK MOD**
-  **Dr Michael Cathcart**, Chief Remote Sensing Group, Principal Research Scientist, **Georgia Technology Research Institute**
-  **Dr John Swegle**, Senior Advisory Scientist, **Savannah River National Laboratory**
-  **Dr Michael Suhrke**, Head of Business Unit Electromagnetic Effects and Threats, **Fraunhofer Institute for Technological Trend Analysis INT**
-  **Dr David N Payne**, Director of Optoelectronic Research Centre, **University of Southampton**
-  **Dr Johan Nilsson**, High Power Fibre Laser Group, **University of Southampton**
-  **Dr Marianne Stuivinga**, Scientist, **TNO Defence Security and Safety**
-  **Dr Ruediger Schmitt**, Senior Scientist – Laser Applications, **French-German Research Institute, ISL**
-  **Dr Michael Von Salisch**, Senior Scientist – Special Laser Applications, **French-German Research Institute, ISL**
-  **Dr Marten Risling**, Experimental Trauma Unit, **Karolinska Institutet and European/EDA/NATO working groups on HPM**
-  **Dr Sjef Orbons**, Senior Researcher, **Netherlands Defence Academy**
-  **Libor Palisek**, Chief Researcher, VOP-26 Sternberk, **Czech Republic**
-  **Daniel Vala**, EMC Research Scientist, VOP-26 Sternberk, **Czech Republic**

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CONFERENCE AGENDA DAY ONE – 23RD FEBRUARY 2011

08.30 COFFEE & REGISTRATION

09.00 Chairman's Opening Remarks

Dr. Chris Pell, Chairman of UK DEW Special Interest Group and an Independent Member of **MoD's Defence Scientific Advisory Council**

09.10 Directed Energy - The Next Generation of Warfare

- Combat Air Force DE Priorities
- Combat Air Force DE Vision
- Combat Air Force DE Challenges and Constraints

Col. Joseph Skaja, Chief of Electronic Warfare, Information Operations and Directed Energy Division, Air Combat Center, **US Air Force**

09.50 Addressing the Escalating Missile Threat - a Systems Perspective

- Top Level systems perspective on the role of missile defence in challenging environments
- Systems engineering implications for Directed Energy Weapon development to be used as an example

Avi Schnurr, Executive Director, **Israeli Missile Defence Association** - Founder and Director of **Tactical High Energy Laser Program**

10.30 COFFEE & NETWORKING

11.00 DEW Test & Evaluation Challenges

- DEW systems and capabilities
- Test and evaluation needs for DEW Systems
- Existing test range capabilities
- Shortfalls in T&E capabilities
- DEW T&E systems development
- M&S support for DEW T&E

Maj Gen George Harrison (ret) and **Dr Michael Cathcart**, Remote Sensors Group, **Georgia Technology Research Institute**

11.40 Overview of the work of the High Energy Laser Joint Technology Office (HEL JTO)

- Outline of current projects and research efforts undertaken by HEL JTO
- Trends and developments within military HEL applications
- Operational considerations and the next steps for battlefield use of HEL

Mark Neice, Director HEL JTO, **US DoD**

12.20 NETWORKING LUNCH

13.30 Future Use of HE Laser Systems – An Assessment Study

- Solid state laser development
- Rationale for their deployment
- Damage modes
- Countermeasures

Dr. Marianne Stuivinga, Scientist, **TNO Defence Security and Safety**

14.10 Laser Safety and Directed Energy

- Impact of HE laser systems on safe training
- Issues with operational use of high energy lasers

Matthew Flower, Head of Laser Safety, Military Laser Safety Committee (MLSC), **UK MoD**

14.50 COFFEE AND NETWORKING

15.20 Fibre Lasers for Directed Energy Weapons: Progress and Opportunities

- Attractions of fiber lasers for directed energy weapons
- Brief overview of state of the art and current R&D efforts
- Future developments and deployment

Dr. David N. Payne, Director of Optoelectronic Research Centre, and **Dr. Johan Nilsson**, High Power Fibre Laser Group, **University of Southampton**

16.00 Physics of Laser Interaction in Military and Homeland Security Applications

- Linear and non-linear energy coupling
- Countermeasure against optoelectronic components
- Laser effects on munitions

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

16:40 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 2um range for jamming and damage treated by ISL

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

17:20 CHAIRMAN'S CLOSE AND END OF DAY ONE

PRE CONFERENCE WORKSHOPS – 22ND FEBRUARY 2011

A 08:30-11:30

State of the Art in High-Power Microwave Systems: Today and Tomorrow

Dr. John Swegle, Senior Advisory Scientist, Savannah River National Laboratory

The current state of the art in the output performance of high-power microwave systems – the output power and energy per pulse and the pulse repetition frequency – is primarily determined by the operation of the microwave source and the output switch in the pulsed power. The mass and volume of the system, on the other hand, are determined largely by the pulsed-power and prime power and power conditioning.

We will lay out the current state of the art and describe which elements can be expected to show significant continued improvement and which elements can be expected to exhibit slower, more incremental improvement.

With this in mind, we will discuss our expectations for the evolution in the state of the art in HPM systems.

B 11:45-14:45

Issues and Challenges Relating to the Operation and Application of Directed Energy Systems

Dr. Michael Cathcart, Chief Remote Sensing Group, Principle 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

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08.30 COFFEE & REGISTRATION

09.00 Chairman's recap

09.10 High Power Microwave Electronics Research in Russian Academy of Sciences

- Overview of current research being conducted by the
- Russian Academy of Sciences
- Implications for HPM directed energy weapons systems
- Conclusions and avenues of future research

Professor Mesyats, Vice-president, **Russian Academy of Sciences**

09.50 Trauma Effects of High Powered Microwaves (HPM)

- Application for HPM
- Research on HPM bio-effects in different organisations
- Different effects from HPM – thermal and non-thermal
- Discussion on pulse duration and comparison to blast trauma
- Relation to security guidelines and Geneva convention

Dr Martin Risling, Experimental Trauma Unit, Karolinska Institutet
Member of European/EDA/NATO working groups

10.30 COFFEE & NETWORKING

10.50 Project DESTO (Direct Energy STOppler)

- Technology demonstrator for remote immobilization of vehicles and boats, disrupting electronic control modules
- Compact tuneable high power microwave systems
- Joint interest by both Italian armed forces and law enforcement agencies
- Protection of high-value assets at sea and on land, establishing no-entry areas
- Collateral applications for stopping escaping violators/neutralisation of IEDs

Capt. Massimo Annati, Italian Navy and Deputy Director of the European Working Group on Non-Lethal Weapons

11.30 Operational Considerations for Non-Lethal Anti-Personnel Directed Energy Weapons

- Technological issues regarding DE NLWs
- Focus: The Active Denial System (ADS)
- Considering scenarios for ADS use
- The implications of ADS deployment under real world conditions
- The wider perspective of DE NLWs

Dr. Sjeff Orbons, Senior Research Scientist, **Netherlands Defence Academy**

12.10 US Army Challenges in the Operational Employment of DE Systems

- US Army's Transition, Transfer and Termination process
- CONUS testing and Forward Operational Assessment (FOA)

process employed

- Safety and Collateral damage issues.
- Operational challenges/Commander acceptance of DE systems
- Measures of Effectiveness employed
- Typical examples of DE systems.
- Lessons learned

Peter Prodenko and Dr. Prasad R. Akkapeddi, US Army
Asymmetric Warfare Office, Threats and Solutions Division, **US DoD**

12.50 NETWORKING LUNCH

13.50 US Army Power System Technology for Directed Energy Systems

- E-Systems considerations for mobile Army platforms
- Power sub-system requirements and challenges for these systems
- ARL power components - research covering power systems for these DE systems

Bruce Geil, Energy and Power Division, **US Army Research Laboratory**

14.30 Scoping the Performance Parameters of an HPM Weapon System

- Practical limits on power and energy per pulse
- Technology limits on pulse repetition frequency
- Size and mass scaling with power and energy

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

15.10 COFFEE AND NETWORKING

15.40 HPM Susceptibility of Electronic Systems

- Nature of the HPM threat
- HPM susceptibility of electronic systems
- Examples of test results
- HPM detection and protection measures

Dr. Michael Suhrke, Head of Business Unit Electromagnetic Effects & Threats, **Fraunhofer Institute for Technological Trend Analysis INT**

16.20 Directed Energy Weapons on the Modern Battlefield

- Electromagnetic threats HPM, UWB, NEMP
- Impact on electronic equipment
- Countermeasures

Libor Palisek, Chief Researcher, and **Daniel Vala**, EMC Research Scientist, **VOP-26 Sternberk, Czech Republic**

17.00 CHAIRMAN'S CLOSE AND END OF CONFERENCE

C 15:00-18:00

Directed Energy Hazards to Civil Aviation Scenarios & Relative Risk Ms Yael Shahar, Director Project Institute for Counter-Terrorism, IDC Herzliya

Over the course of this 3 hour session, this workshop will discuss some of the key directed energy applications which could be a potential hazard to civil aviation. By running through some of the technologies which could pose a threat, the workshop narrows in on potential scenarios where these threats pose significant danger.

OVERVIEW

Directed and Diffuse Energy Weapons

- Mode of operation
- Types of E-bomb
- Explosively Pumped Flux Compression Generators (FCG)
- Explosive and Propellant driven Magneto-hydrodynamic (MHD) Generators
- High Power Microwave Sources

Vulnerabilities

- Vulnerabilities to interference from inside the aircraft
- Vulnerabilities to external radio frequency radiation

Lethality of E-bombs

- Size considerations
- Footprint
- Lethality of HF weapons
- Lethality considerations for aircraft

Defence

- Faraday cages
- Detection
- Testing

Electronic Testing

- Weapon Availability

SCENARIOS & RELATIVE RISK

Factors influencing scenario rating

- Attack-Type Parameters
- Sensitivity Parameters
- Organization-Type Sensitivities

Sample Scenarios

- RF Device in carry-on
- Device in cargo hold
- HPM attack on aircraft on take-off or landing

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