

Directed Energy Weapons '09

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Driving DEWs from the Laboratory to the Battlefield
25th - 27th February 2009 | Thistle Marble Arch, London

Exclusive briefings delivering insights into:

- The latest technology developments for DEW and updates on current R&D projects and ongoing programmes, including the **Active Denial System**, **Airborne Laser Programme** and **pulsed power portable devices**, to keep you at the forefront of the next generation of weapons
- **Evolving national policy** and **political challenges** for fielding Directed Energy capabilities
- **Biological impacts for the operator and subject** of Directed Energy applications and insights into vulnerability of military equipment and IT infrastructure
- Scientific developments into **power sources for High Powered Microwaves and High Energy Lasers** and updates on **focused beam strength** and future DE applications

Featuring high-level briefings from:

- Chairman: Dr. J. Douglas Beason**, PhD, Associate Laboratory Director (Threat Reduction), **Los Alamos National Laboratory**
- Spiro G. Lekoudis, Ph.D. SES**, Director, Weapons Systems, Office of the Deputy Undersecretary of Defense (Science & Technology), **US DoD**
- Colonel David Robie**, Director, Directed Energy Task Force, **USAF**
- Dr. Greg Schneider**, Director, **NATO Research and Technology Agency**
- Dr. Benjamin Rockwell**, Head of Laser Bio-Effects, **US Air Force Research Laboratory**
- Dr. Jacques Dubois**, Electro-Optic Warfare Section, DRDC Valcartier, **Canadian MoD**
- Susan LeVine**, Deputy Director, Joint Non-Lethal Weapons Directorate, **US DoD**
- Dr. Sjef Orbons**, Senior Research Scientist, **Netherlands Defence Academy**
- Professor Jürgen Altmann**, Senior Professor, **Universität Dortmund**
- Dr. Stuart Dowling**, Department of Engineering Systems and Management, Defence College of Management and Technology, **Cranfield University & Member Military Laser Safety Committee**
- Dr. Michael Cathcart**, Chief, Remote Sensing Group, Principal Research Scientist, **Georgia Technology Research Institute**
- Eric Liggins**, Human Vision Group, **QinetiQ**
- Confirmed Representation from European Defence Agency**
- Dr. Rüdiger Schmitt**, Senior Scientist, **French-German Research Institute of Saint Louis (ISL)**
- Ms. Yael Shahar**, Director, Database Project Institute for Counter-Terrorism, **IDC Herzliya**

Pre-Conference Directed Energy Master Class Day | 25th February 2009

A – 10.00 - 13.00

Operational Aspects of Directed Energy Systems

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

B – 13.30 - 16.30

Directed Energy Hazards to Civil Aviation

Presented by: Yael Shahar, Director, Database Project Institute for Counter Terrorism, **IDC Herzliya**



Directed Energy

WORKSHOP DAY 25th February 2009

A – 10.00-13.00 OPERATIONAL ASPECTS 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 weapons in the near future a reality. These unconventional weapon systems bring both unique capabilities and challenges to the battlefield. 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 employment of these systems on the battlefield. These issues cover a range of areas including component technologies, materiel support, engagement tactics, and safety.

This master class 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

Basics of directed energy system engineering, propagation effects, and weapon effects will be reviewed to provide a basis for the deployment discussion with regards to:

- DE system engineering
- DE component technologies (sources, beam control, power, & thermal)
- Weapon use and effects
- Safety & collateral damage
- Logistics & maintenance
- Example applications

B – 13.30-16.30 DIRECTED ENERGY HAZARDS TO CIVIL AVIATION

Led by: Ms. Yael Shahar, Director, Database 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
- Attack "Appeal"

CONCLUSIONS

DAY ONE 26th February 2009

08:40 Registration and Coffee

09:00 CHAIRMAN'S WELCOME AND OPENING SPEECH

Dr. J. Douglas Beason, PhD, Associate Laboratory Director (Threat Reduction), *Los Alamos National Laboratory*

09.10 HOW DID WE GET TO FIELDING DIRECTED ENERGY WEAPONS?

- Brief analysis of weapon development
- Context of next generation weapons
- Where we are today?

Dr. J. Douglas Beason, PhD, Associate Laboratory Director (Threat Reduction), *Los Alamos National Laboratory*

09:50 TOPICS IN DIRECTED ENERGY SCIENCE & TECHNOLOGY

- Directed Energy, Lasers & High Power Microwaves
- DoD Science & Technology on Directed Energy
- Potential applications and issues

Spiro G. Lekoudis, Ph.D. SES, Director, Weapons Systems, Office of the Deputy Undersecretary of Defense (Science & Technology), *US DoD*

10:30 Coffee and Networking Break

11:00 DIRECTED ENERGY COUNTERMEASURES BASED ON TERAWATT FEMTOSECOND LASER

- Outline of DRDC laser research and development
- Auto-focusing and increasing of power density
- Propagation of the femtosecond terawatt laser through filamentation and white light generation
- Counter measure applications including frosting of optics and neutralisation to weapons electronics

Dr. Jacques Dubois, Electro-Optic Warfare Section, DRDC Valcartier, *Canadian MoD*

11:40 MILLIMETRE WAVES, LASERS, ACOUSTICS FOR NON-LETHAL WEAPONS: PHYSICS ANALYSES AND INFERENCES

- International ramifications of widespread proliferation of Directed Energy Weapons
- Technical analysis of the framework behind Directed Energy Weapons
- Scientific conclusions for foreseeable future of Directed Energy Weapons

Professor Jürgen Altmann, Senior Professor, *Universität Dortmund*

12:20 Networking Lunch

13:30 DIRECTED ENERGY BIO-EFFECTS: A MAIN ENabler TO DIRECTED ENERGY WEAPONS

- Overview of effects on humans due to exposure from laser and high powered microwaves
- Understanding bio-effects as a crucial factor leading to policy approval of directed energy weapons
- Policy restrictions due to human effects

Dr. Benjamin Rockwell, Head of Laser Bio-Effects, *US Air Force Research Laboratory*

14:10 ANALYSIS OF BIO-EFFECTS OF ELECTROMAGNETIC RADIATION FOR THE OPERATOR AND THE SUBJECT

- Research into the medical effects of electromagnetic effects from laser use
- Implications for both the user and the subject
- Distance and laser strength
- Legal implications of laser weapons

Eric Liggins, Human Vision Group, *QinetiQ*

14:50 Coffee and Networking Break

15:20 FACILITATING THE TRANSITION AND USE OF THE ACTIVE DENIAL SYSTEM (ADS) TO THE WARFIGHTER

- Need for the education of military leadership on the capabilities of Active Denial Technology
- Filling the gap between shouting and shooting
- 'System 2' status and possible operational deployment

Susan LeVine, Deputy Director, Joint Non-Lethal Weapons Directorate, *USMC*

16:00 ACTIVE DENIAL SYSTEM: THE LIMITATIONS AND RESTRICTIONS IN THE FIELD

- Problems associated with the introduction of new concepts and technologies
- Utility of systems in real world conditions: The warfighter vs. the PhD
- Potential European limitations against the operational fielding of the ADS

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

16.40 Chairman's Comments

KEYNOTE

Weapons 2009

DAY TWO 27th February 2009

08:00 Registration and Coffee

09:00 Chairman's Opening Remarks

09:10 WEAPONISATION OF DIRECTED ENERGY IN THE 21ST CENTURY

- Advances in DEW science and technology
- Difficulties of generating directed energy and making effective weapons from the technology
- Future DEW capability and policy implications

Dr. J. Douglas Beason, PhD, Associate Laboratory Director (Threat Reduction), *Los Alamos National Laboratory*

09:50 UTILISING EXPLOSIVE ENERGY FOR EFFECTIVE AND LIGHTWEIGHT ELECTROMAGNETIC APPLICATIONS

- Brief overview of DE energy options
- Ensuring balance between practical, cheap and effective useable energy
- Harnessing effective power from explosive energy
- Future developments in explosive powered DE Weapons

Dr. Stuart Dowling, Department of Engineering Systems and Management, Defence College of Management and Technology, *Cranfield University & Member Military Laser Safety Committee*

10:30 Coffee and Networking Break

11:00 BRIDGING THE KNOWLEDGE GAP FOR DIRECTED ENERGY WEAPON SYSTEMS

- Identification of the problem
- Understanding DE systems and capabilities
- Safety and collateral damage
- Overcoming the knowledge gap

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

11:40 PANEL DISCUSSION WHAT ARE THE IMPLICATIONS FOR INSERTING DIRECTED ENERGY WEAPONS INTO WAR ZONES AND PEACE KEEPING MISSIONS

- Discussion of policy for speed of light weapons
- Rules of engagement: Geneva Convention
- Acquisition of Directed Energy capability: What do you sacrifice?
- Engineering questions: PhD's on the battlefield

LED BY Dr J. Douglas Beason, PhD, Associate Laboratory Director (Threat Reduction), *Los Alamos National Laboratory*

12:20 Networking Lunch

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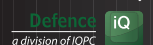
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13:30 DIRECTED ENERGY WEAPONS RESEARCH AND DEVELOPMENT FOR NATO NATIONS: NATO RESEARCH AND TECHNOLOGY AGENCY

- Role and importance of the agency
- Assessment and findings for scientific studies from 'Task Groups' on Directed Energy
- Top down and bottom up organisation for Directed Energy research and policy

Dr. Greg Schneider, Director, *NATO Research and Technology Agency*

14:10 DIRECTED ENERGY (DE) TASK FORCE REVIEW OF OPERATIONALLY RELEVANT DE PROGRAMMES

- Review of applications from long range strategic missions to tactical manoeuvre and ground based defence
- Increasing the attention on laser, microwave and millimetre wave weapons
- Evolving DE policy and vision for the future with promising operational applications

Colonel David Robie, Director, Directed Energy Task Force, *USAF*

14:50 Coffee and Networking Break

15:20 PHYSICS OF LASER INTERACTION IN MILITARY AND HOMELAND SECURITY APPLICATIONS

- Linear and non-linear energy coupling
- Heating, melting, vaporisation and ablation
- Thermo-mechanical effects
- Morphological damage
- Countermeasures against optronic components
- Laser effects on ammunitions

Dr. Rüdiger Schmitt, Senior Scientist, *French-German Research Institute of Saint Louis (ISL)*

16:00 DIRECTED ENERGY IN THE EUROPEAN DEFENCE AGENCY (EDA)

- Importance of Directed Energy within the EDA programme for Non-Lethal Weapons
- DEW capabilities within Europe
- On-going and future DE programmes within the EDA framework

Confirmed Representation from *European Defence Agency*

16:40 End of Conference

DIRECTED ENERGY WEAPONS 2008

Very valuable, both networking discussions and the presentations

Dr. Rüdiger Schmitt, Senior Scientist, *French-German Research Institute of Saint Louis (ISL)*

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