

# Using a layered model to place EW within its proper context

Presenter : F. Maasdorp

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# 2011 AOC theme:

- “A balanced approach to meet the **EW** demands of **potential future conventional** and **irregular warfare threats**”

# Presentation Outline

- Background on the “rightful place of EW” debate
  - Journal of Electronic Defence (JED) quotes
- Novel solution for placing EW within its proper context
- Tie up the title to the AOC theme
- Provide some practical examples
- Conclusions
- Questions

# Background – Motivation (1)

“Using a layered model to place EW within its proper context”

- Debates on the rightful place of EW
  - International level
  - Conferences
  - Journal of Electronic Defence (JED) articles
- EW's place amongst:
  - Information warfare (IW)
  - Cyber,
  - Information Operations (IO).
- JED
  - Background - Journal distributed monthly by the Association of Old Crows (AOC) - members
  - Use quoted phrases from recent articles in the JED.

# Background – Motivation (2)

- Col. (Ret) L. Buckhout
  - “EW across the future spectrum of conflict – a balancing act”
- Brig Gen. A.J. Coetzee
  - “EW in the fifth dimension”
  - Challenge - “How does the Information Sphere look???”

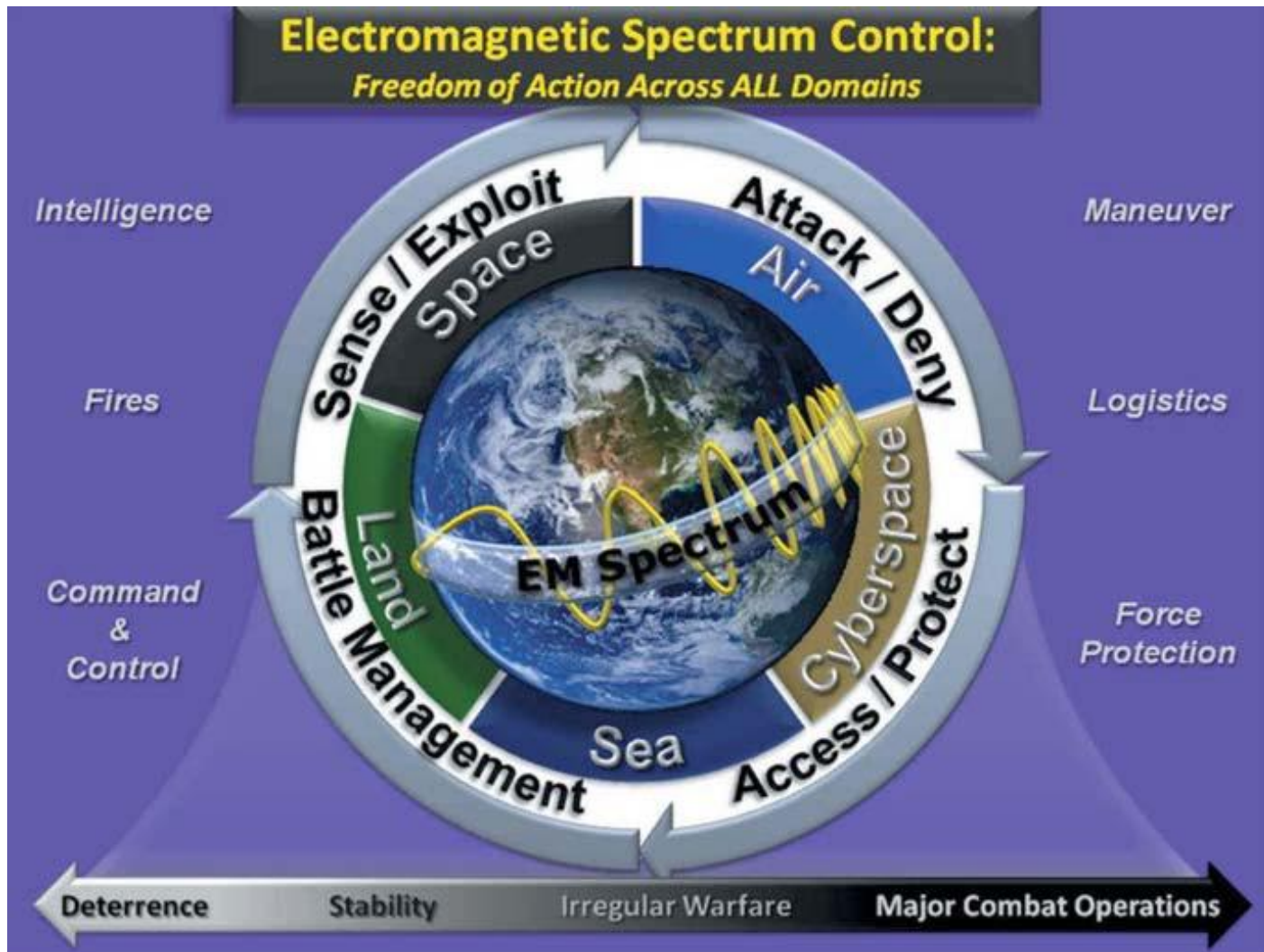
# EW in context – JED Quotes (1)

- Wg Cdr (Ret.) John Clifford (March 2011)– OBE RAF
  - “Over the past year or so, many in the EW community, at conferences and through JED articles, have begun to question the place of EW in the greater scheme of things. At it’s heart, this questioning concerns a concept for EW and it’s terminology and doctrine....
  - “Some discussion about physics, terminology and concepts may help illuminate future deliberations about the place, role and conduct of EW, and it’s place in the warfighting domain, which this article proposes should be recognised as the Electromagnetic Domain”

# EW in context – JED Quotes (2)

- Lt Col Jeffery Fisher (Sept 2010)
  - “I believe, as every day goes by and the US becomes increasingly dependant on the EMS, eventually the EMS will gain its rightful place as a warfare domain alongside air, land, sea, space and cyber”
- Lt Col (Ret) Jesse Bourque (Oct 2010)
  - “The term EW itself is arguably dead language despite its majestic legacy, because it distracts us from the essential understanding that warfare in the spectrum isn’t a group of things or electronics, or even the fixation on information many want it to be”
  - “It is instead the critical range of “top-down” operations and responsibilities centred on controlling the energy of the EMS for operational use, or achieving EMS control. The term EMS warfare logically follows from that understanding.”

# Current Approach – Electromagnetic Spectrum Control





# EW in context – JED Quotes (3)

- Rob Hahn (Nov 2010) – Deputy Director for the Joint EW Centre at US Strategic Command
  - “Physics of the Cyber – EMS problem, Why we have the language wrong”
  - “Technologies used in any domain will continue to change at a rapid rate. Therefore, defining a domain by the technology that operates in that domain (as opposed to the physical principle and laws of that domain) is a flawed concept that has created many issues that both...”
  - “Currently we are spending billions of dollars on something called Cyberspace. The problem with this strategy is that we are missing the other half of the equation, which is the EMS...We cannot defend in Cyberspace – even under it’s current definition – if we cannot control the EMS.”

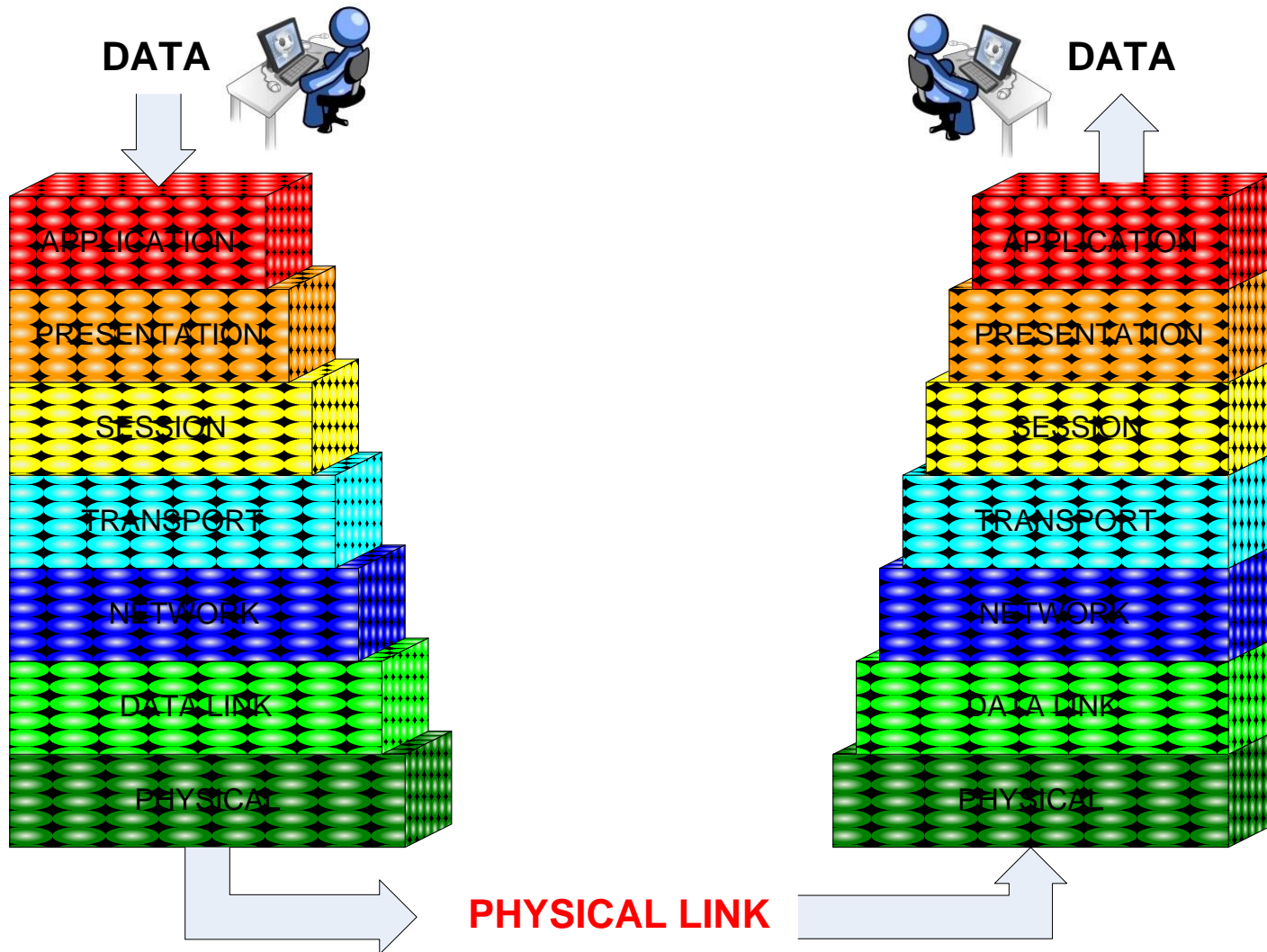
# EW in context - OSI model

- Early 1980s two domains faced a dilemma of merging:
  - Telecommunications
  - Computers
- Establishment of the Open Systems Interconnections (OSI) model
  - International Organisation for Standardisation (ISO)
  - Developed an architecture for computer communications.
  - Defining protocols to connect multiple computers for mass distribution of information.
  - While maintaining compatibility over various different platforms (operating systems, hardware platforms etc.)

# EW in context – The concept of abstraction

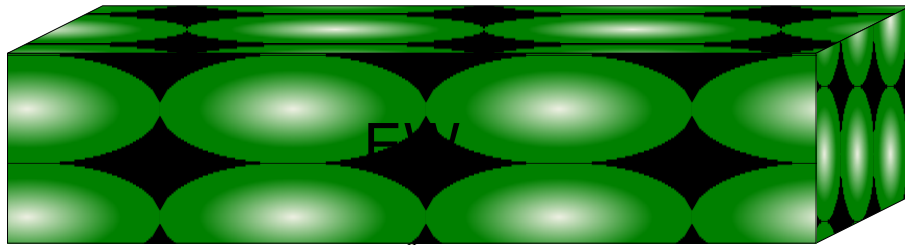
- Only required information necessary within a bigger scheme of things
- The internet as an example
  - Software programmer
    - Operating System
  - Network specialist
    - Delay, Bandwidth, Reliability
  - RF specialist
    - Frequency to use
    - Modulation scheme
- Comments on the position in hierarchy
  - Does not imply
    - Importance
    - Complexity
  - Merely a way of defining levels interacting to one another

# EW in context - OSI model (cont.)



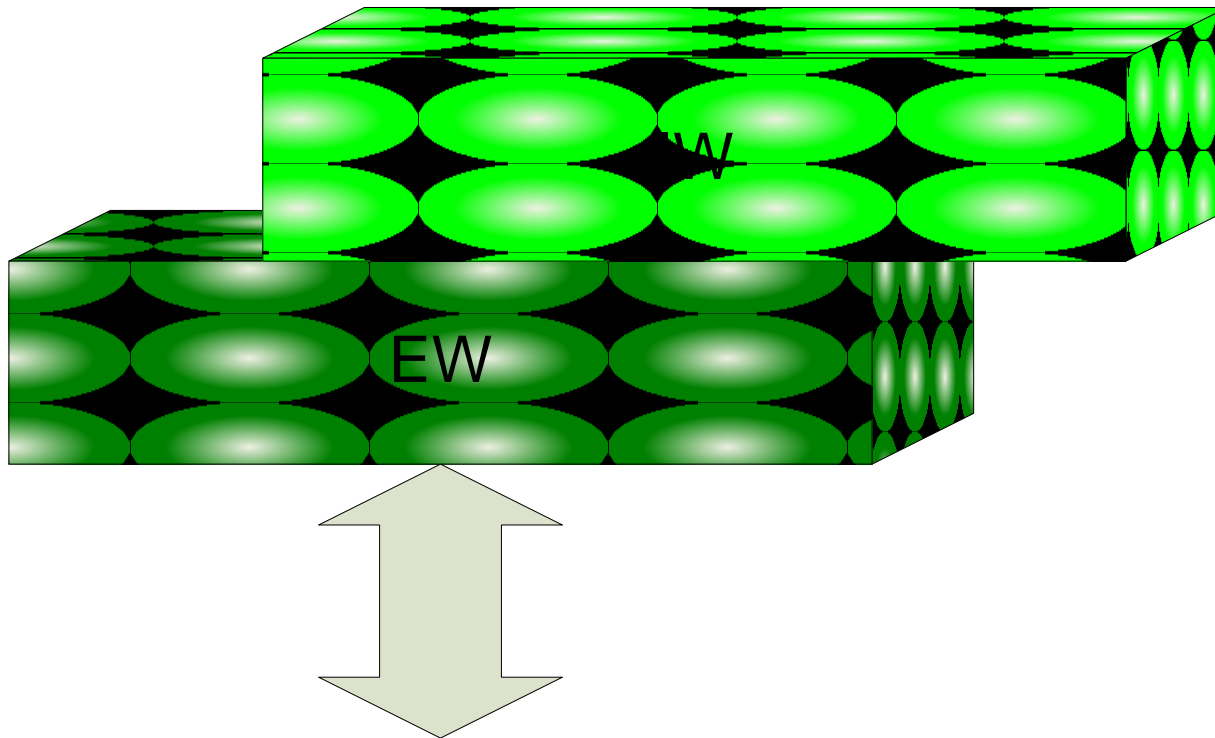
# EW in context – The EW layer

- “Using a layered model to place EW within its proper context”



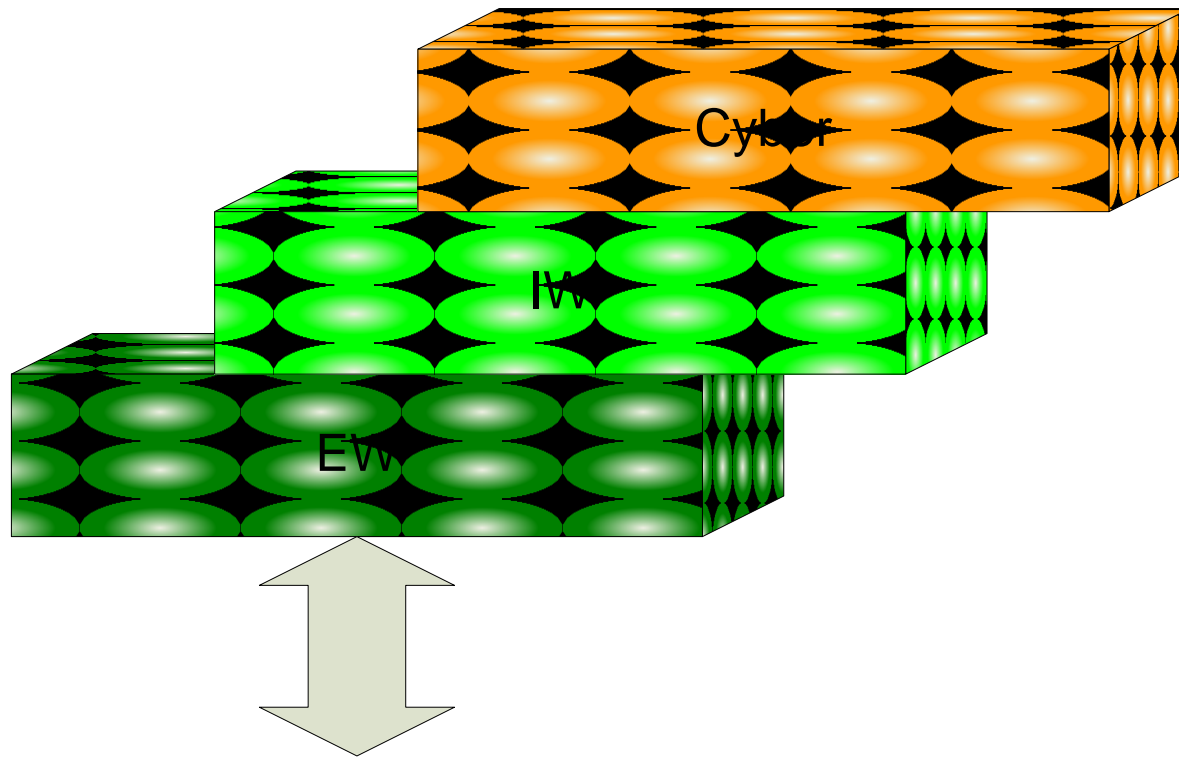
**Electro Magnetic Spectrum**

# EW in context – The IW layer



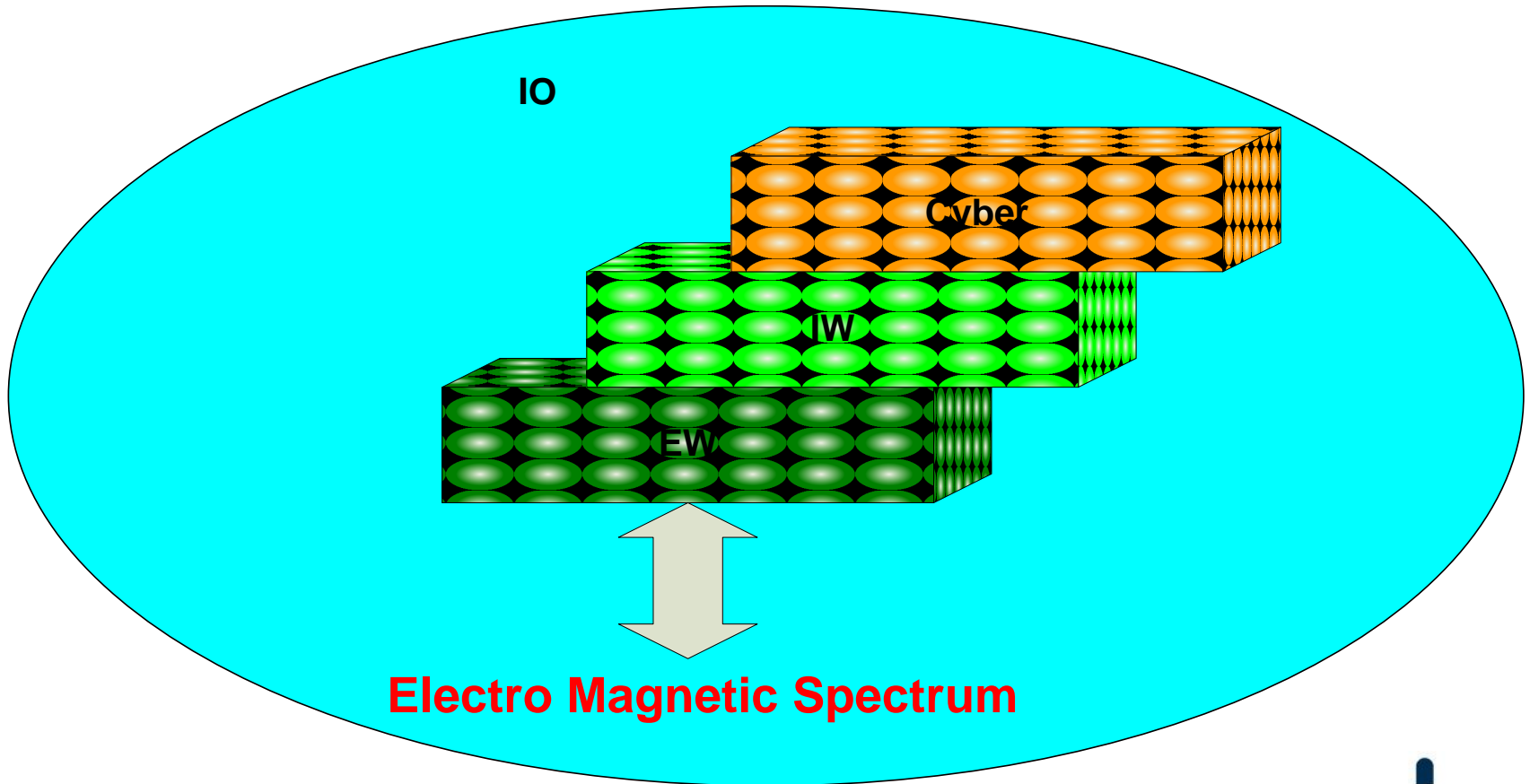
**Electro Magnetic Spectrum**

# EW in context – The Cyber layer



**Electro Magnetic Spectrum**

# EW in context – Information Operations (IO)





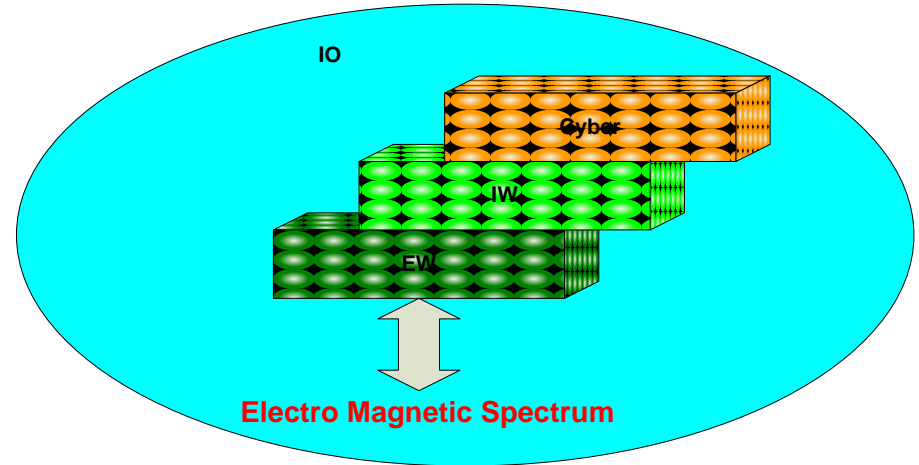
# How does this tie up with the AOC theme?

“A balanced approach to meet the **EW** demands of **potential future conventional** and **irregular warfare threats**”

- Way to address future threats
  - Conventional and Irregular
  - Definitive objective at each layer – abstraction
    - EW, IW, Cyber
    - Essential that EW, IW, Cyber experts work together on threat analysis/solution for IO
    - Note, not only confined to IO – merely an example
- Example of success using abstraction
  - The internet

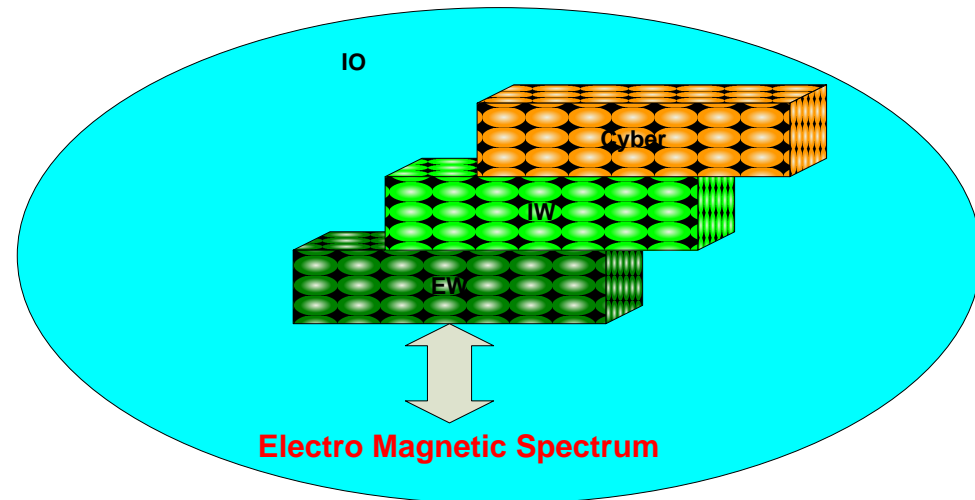
# Example 1 – Global Navigational Satellite Systems (1)

- GNSS
  - GPS
  - GLONASS
  - Galileo
- GPS used by the SANDF
  - Position
  - Data synchronisation/timing
- Is the GPS measurements as displayed by the GPS true?
  - Position
  - Time

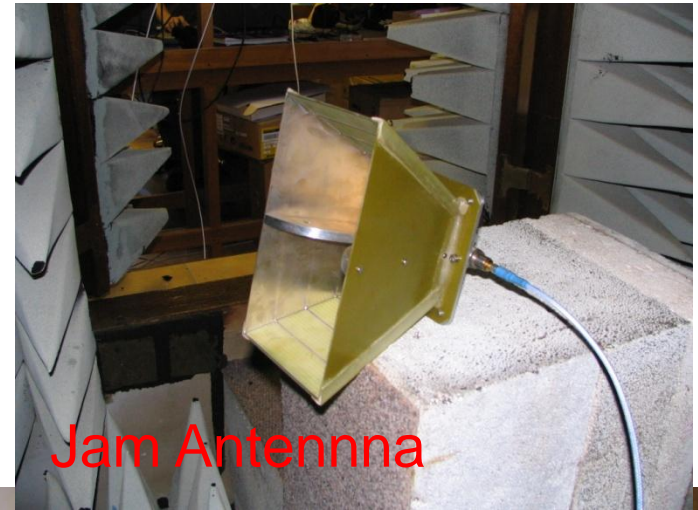
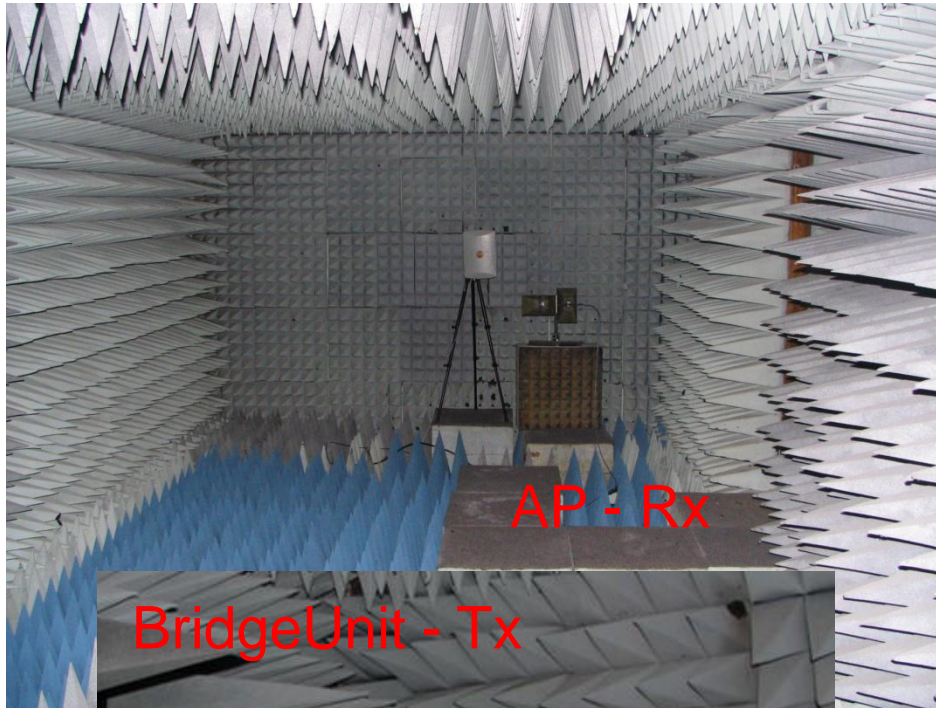


# Example 2 - Communication Links (1)

- Denial of service attack
- Classic approach
  - Overwhelm of power
  - Noise jamming
  - Effect on own forces
- Modern approach
  - Smart jamming, tailored approach.
  - Perform an attack without effecting own forces

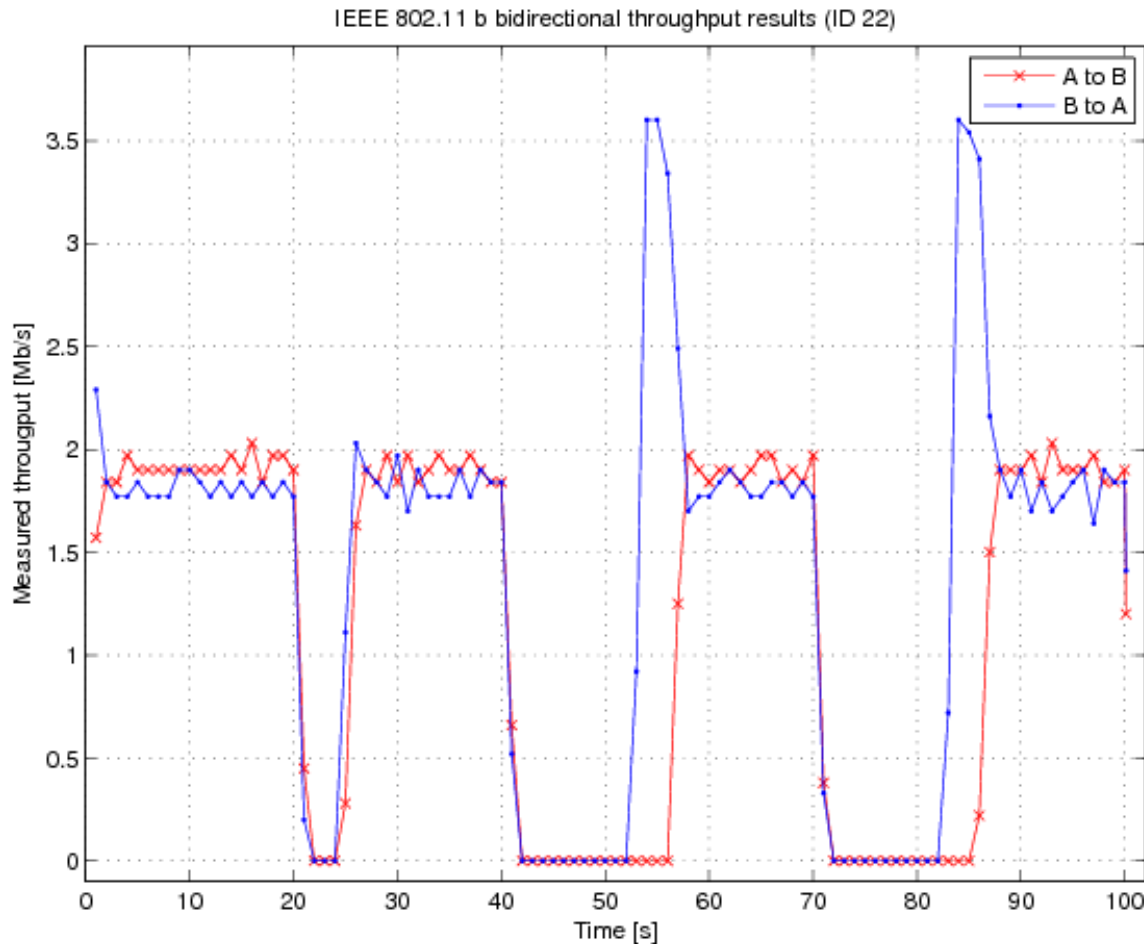


# Example 2 - Communication Links Setup (2)



# Example 2 - Communication Links Results (3)

- Performed smart jamming on the WiFi link – thus link were not disabled but had a 0 throughput rate.



JAM on:

- 20 s (for 1 s)
- 40 s (for 2 s)
- 70 s (for 3 s)

# Conclusion

- World wide debate on placing EW in context
  - A lack of concept for EW and it's terminology
  - All debates essentially saying the same thing – just need a supportive model
- Proposed a method to place EW in context
  - Layered model, based abstraction
  - EW on bottom layer – interface with EMS
  - Higher layers/definitions open for discussion
- Power/Value of a layered model
  - Define an expert per layer
  - Method to analyse future threats - conventional and irregular
  - Essential that EW, IW, Cyber experts work together on future threat analysis/solution for IO
- To be presented at International AOC
  - Washington DC, November 2011
- Acknowledgements
  - Christo Cloete & Warren Du Plessis

# Demo GPS Spoofing - Scenario

- Actual GPS Location: CSIR, DPSS.
- Spoofed Location: Johannesburg Telkom Tower, +/- 50km away.
- Actual GPS date : 12 August 2011, 15h47m21s.
- Spoofed GPS date : 12 August 2011, 11h00m00s.

QUESTIONS?