



# The use of Electromagnetic Warfare to Enhance Support to Surface Operations

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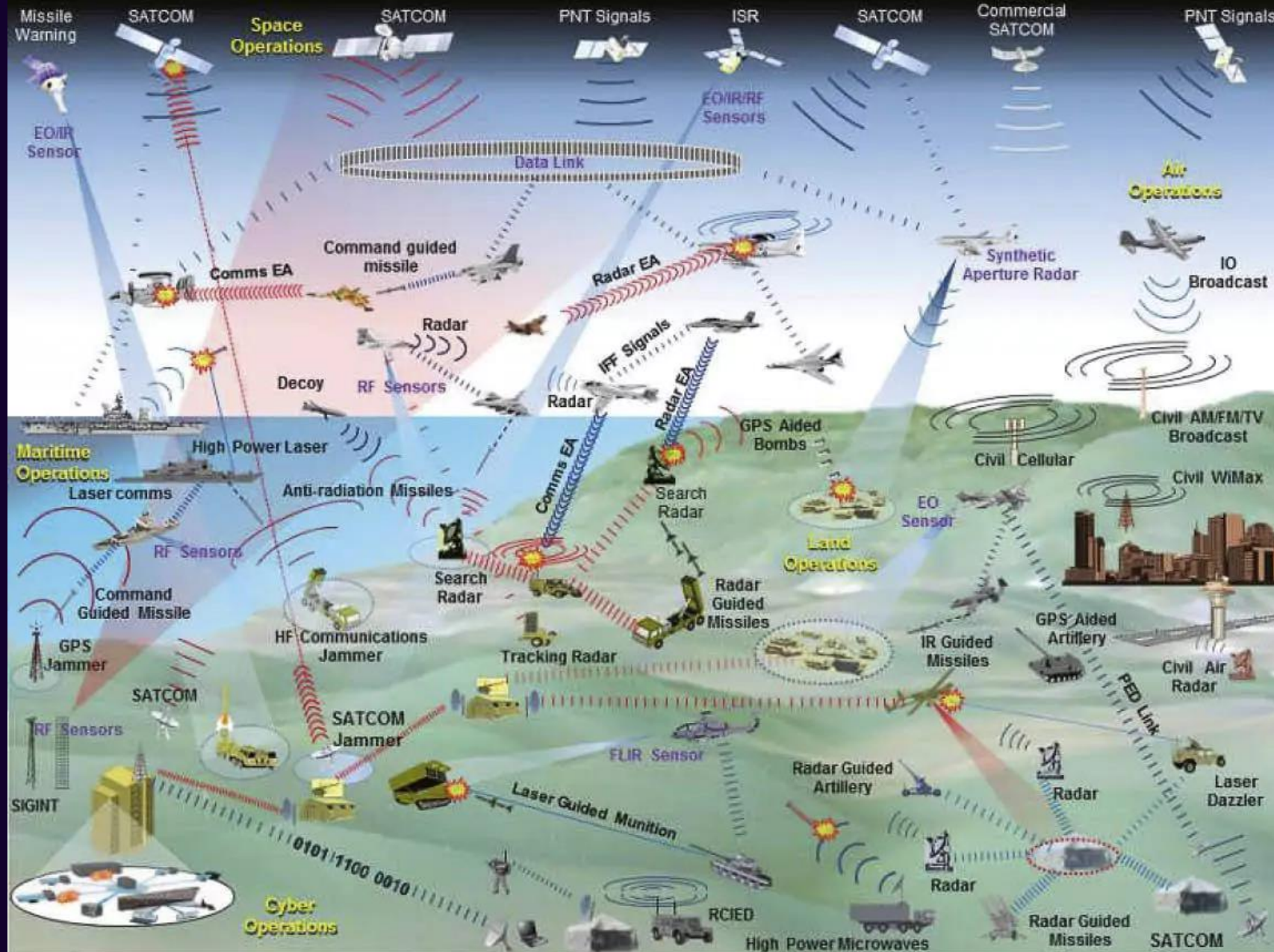
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- The Challenge with the Electromagnetic Environment (EME)
  - NATO EM View and EW Contribution to Operations
- Addressing the Congestion, Contested, Degraded & Denied Environment
- Visualise, Monitor, Deconflict (i.e. operate freely), Protect/Guard
- Things to do : Prepare, Plan, Configure and Contest
- EW Plan, Execute for Passive & Active Countermeasures, Evaluate, Refine.
- The **One** EW layer concept
- Use Case
- Questions
- Bonus Slides...for later

# EW Contribution to Combat Operations



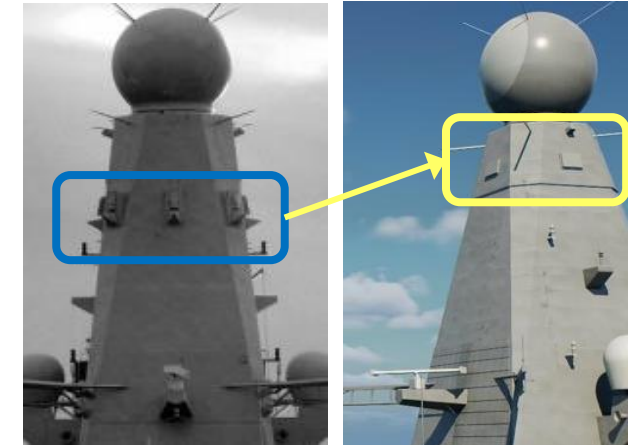
- Breaking down C2D2E *Its not what you think....*
- The EME is **not** Congested – it is our Sensors that are Congested
  - Theory Time : move from Time dimension to the Frequency dimension with time, where the EME lives

$$X(f) = \int_{-\infty}^{\infty} x(t)e^{-j2\pi ft} dt$$

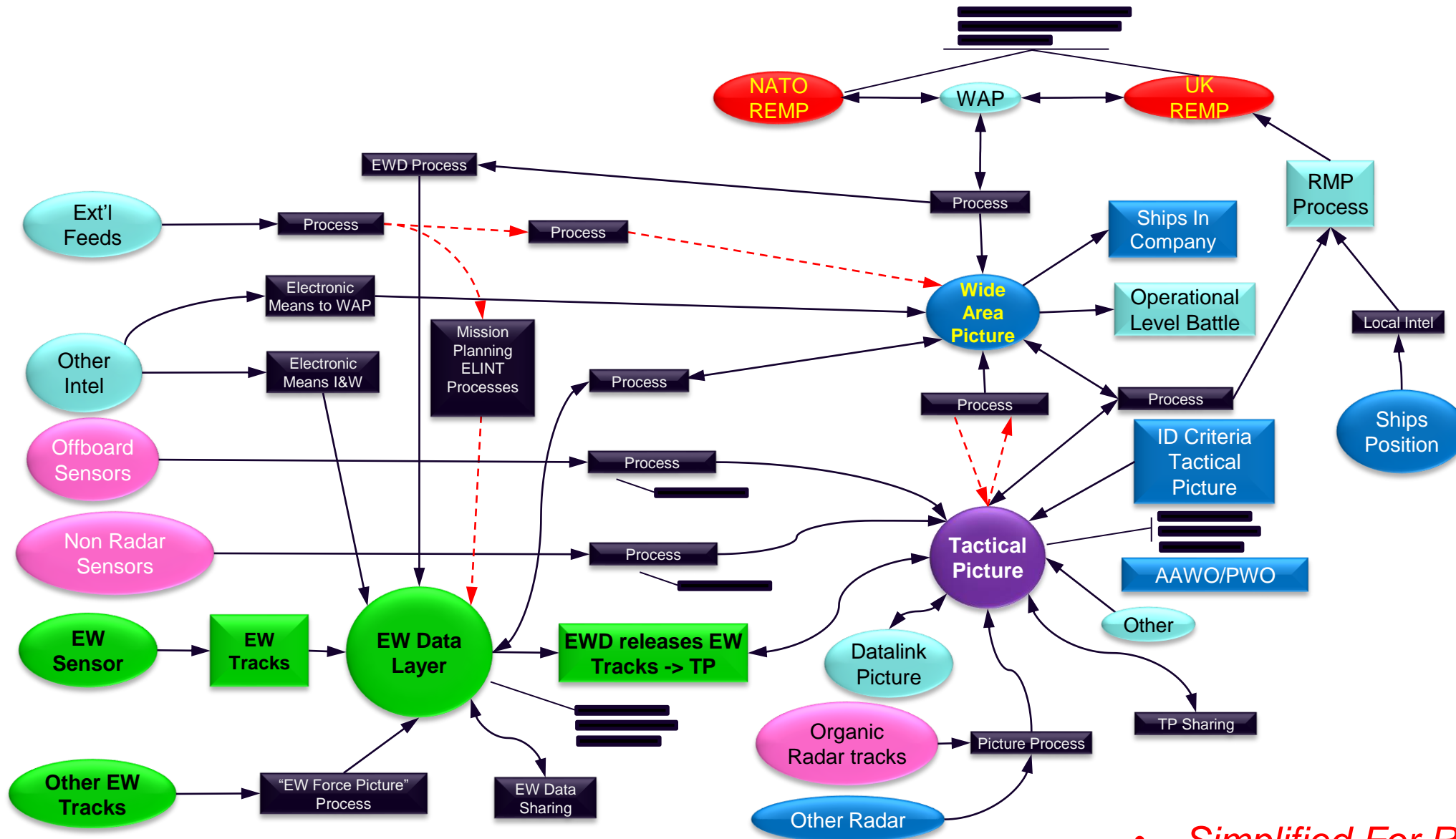


$$X(k) = \sum_{n=0}^{N-1} x(n)e^{-j2\pi kn/N}$$

*In Theory its **only** Maths In Practice its **Processing Power**  
...digitise and channelise the EME*

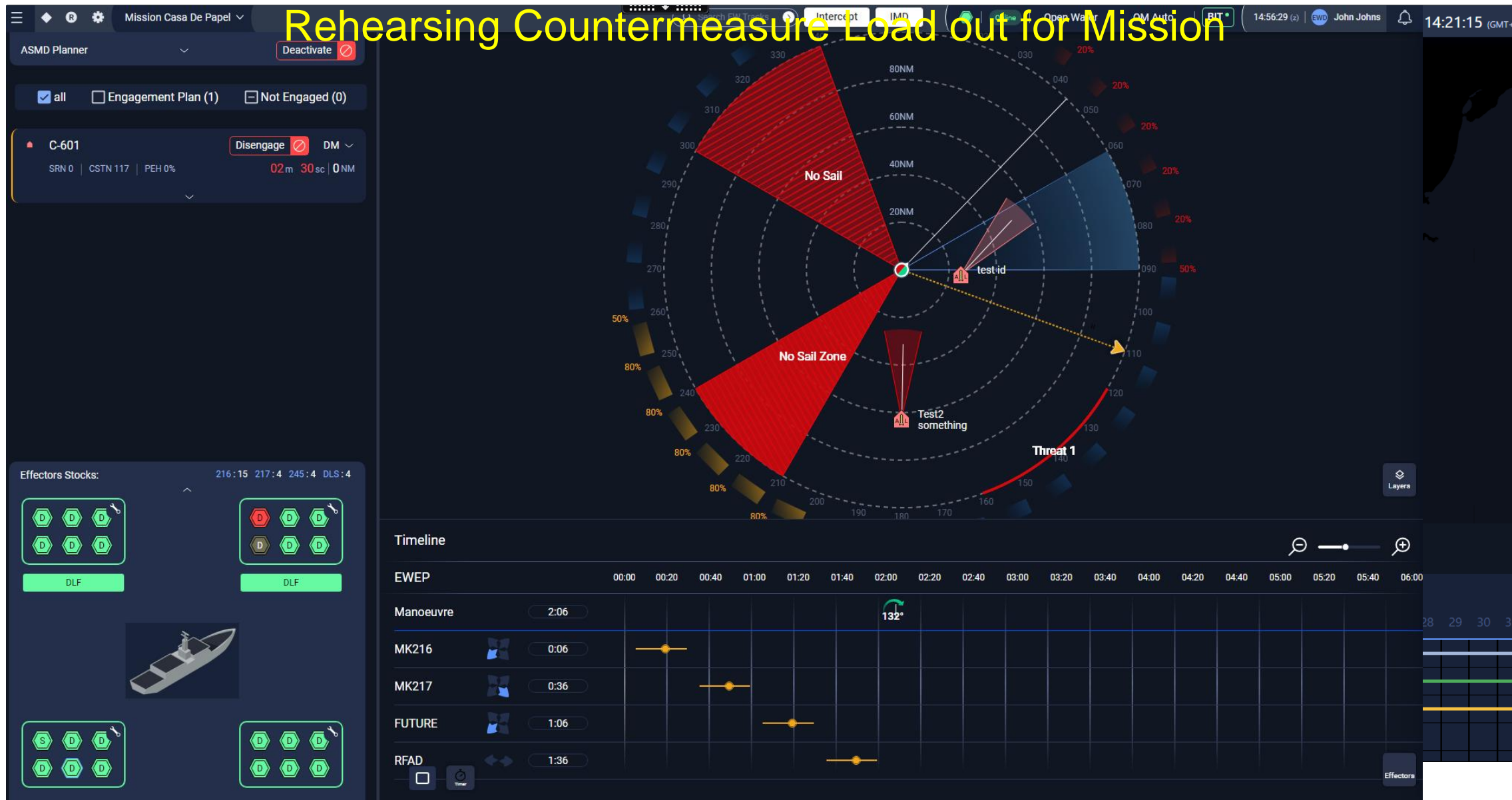


- Wide band, high gain planar arrays and digital receivers (Discrete Fourier Transforms)
- Higher gain means you see more; potentially improving Situational Awareness
  - Comms signals, Datalinks, Commercial Mobile are in our bands of operation....needs managed, **cannot** demodulate but can detect such Electromagnetic Emissions especially in the littoral, this is exploitable data
- Precision measurements, ELINT quality for real-time tactical advantage
- Matched signal processing to extract more modern modulated LPI/LPE signals



• *Simplified For Release*

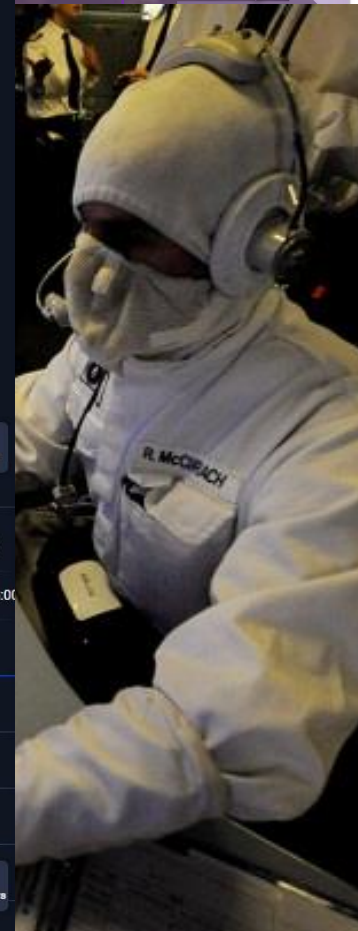
## Rehearsing Countermeasure Load out for Mission



## Anti-Ship Missile Defence

The screenshot shows a complex software interface for Anti-Ship Missile Defence. At the top, there's a navigation bar with 'Intercept' and 'IMD' buttons. The main display is a radar plot with concentric circles representing 20NM, 40NM, and 60NM ranges. A red sector is labeled 'No Sail', and a larger red area is labeled 'No Sail Zone'. A yellow arrow points to a target labeled 'Threat 1'. Other targets are labeled 'test id' and 'Test2 something'. To the left, the 'ASMD Planner' panel shows a 'Disengage' button and a timeline for MK216. Below that, an 'Events list' shows four items: MK216, MK217, FUTURE, and RFAD, each with a 'Veto' button. The 'iKill Card' panel lists various parameters like 'Range gates [NM]: 0.1', 'Seeker characteristics: PRI 200 us | Freq. 2500 MHz', and 'Fly through Behaviour: Text'. At the bottom, a 'Timeline' section shows a grid for EWEP with a 'Manoeuvre' of 2:18 and a '133°' indicator. The interface also includes 'Effectors Stocks' and 'Layers' controls.

ace  
New RWO



Low Info Quality

Everything in the Right Place






34 Merchant Ships Attacked, 61 ASMs Launched  
60/40% ~split ASCM vs ASBM



Month	ASCMs	ASBMs	ASMs	Ships
Nov/Dec-23	8	8	16	10
Jan-24	7	2	9	8
Feb-24	5	9	14	8
Mar-24	18	4	22	8
<b>Totals</b>	<b>38</b>	<b>23</b>	<b>61</b>	<b>34</b>

- The EME is pervasive in every theatre of modern warfare – exploit it or be defeated
- Evidenced by the Use Cases of Ukraine and the Red Sea
- EW cuts across all types of platforms, weapon systems and is key for military manoeuvre
- EW is an operational necessity for combat surface operations
- Planning and rehearsal for EW operations is essential to avoid fighting the wrong battle
  - Remove the Congestion problem, and prepared for the Contest
  - Manage and exploit the Degraded EME, prepared to be the Denial actor
- It is one EME and EW actions must be viewed through that one lens to deliver the mission
  - Situational Awareness, ELINT, Electromagnetic Attack and Electromagnetic Defence
  - This mitigates the potential Asymmetric EME avenues
  - Forms a core layer of the Tactical Picture/Common Operating Picture.
- Design for capability openness where you need it, spiral it as you need it, it will fight for you
  - The Technology is the enabler, the “Thinking” is the means to success



**[dstl]** The Science Inside

Thank you  
& Qs?

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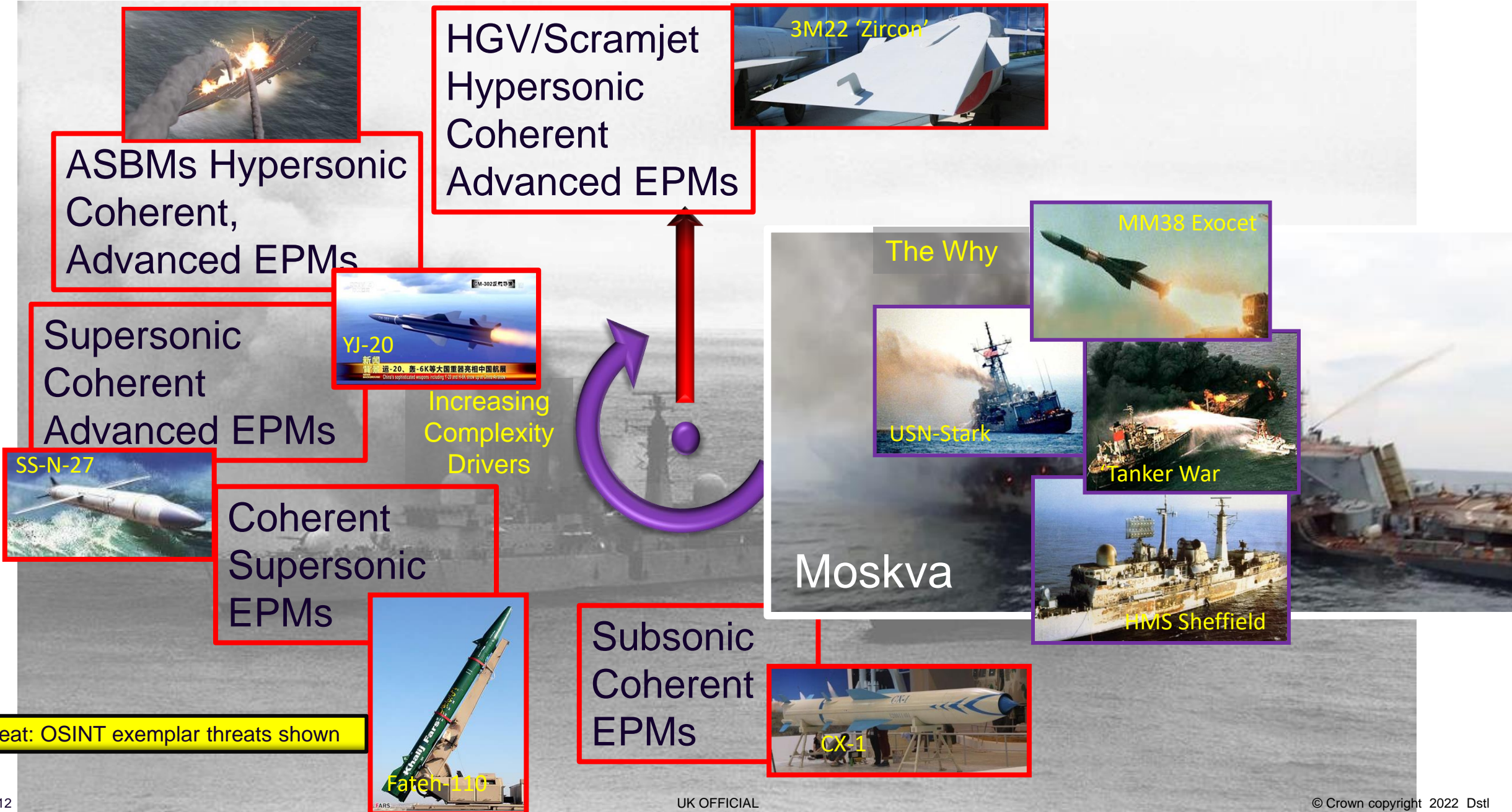
Ministry  
of Defence

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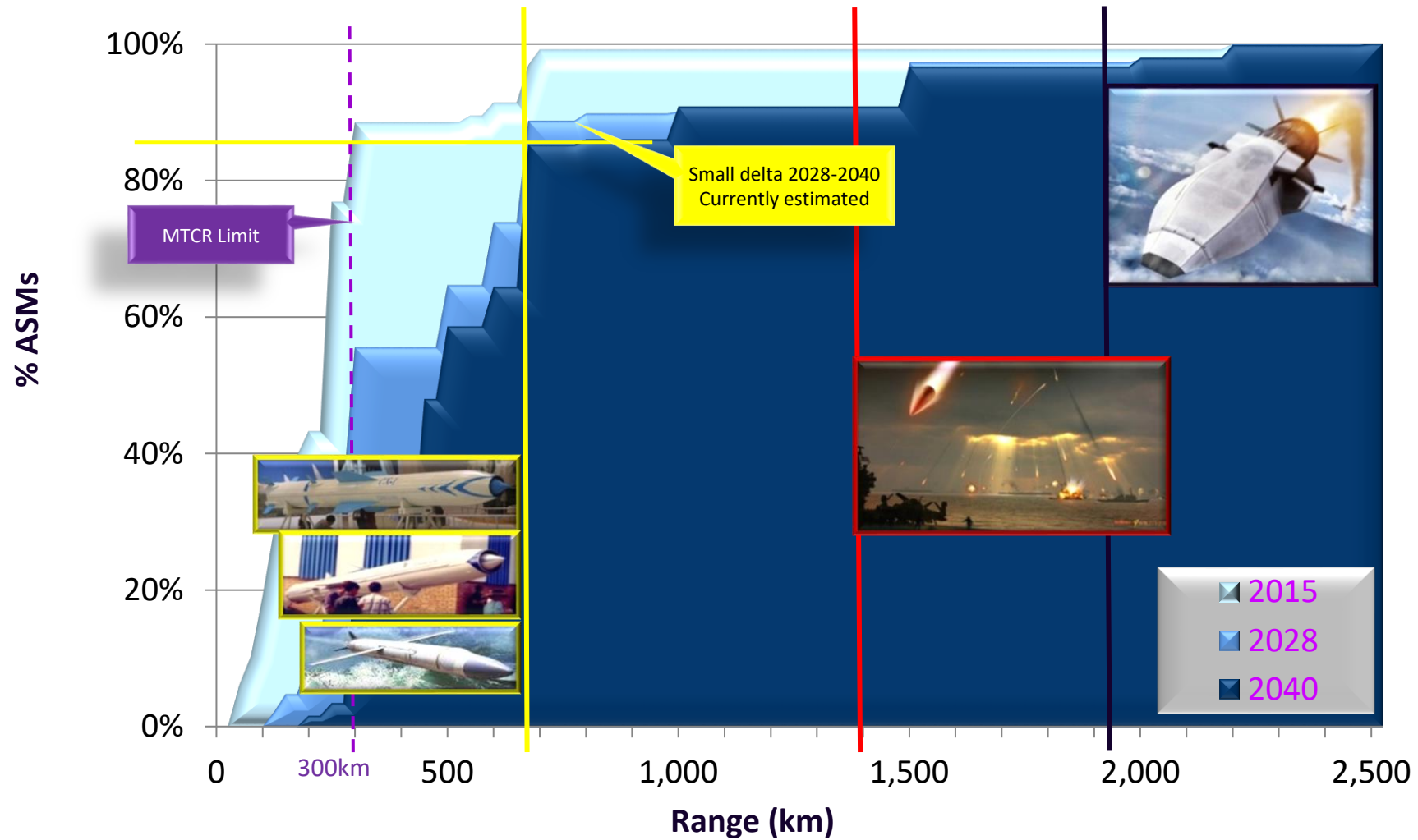
28 May 2024

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# The Threat Clock - Threat features



# Projection of Threat Range to 2040 (as of 2015 Open Sources)



- ASMs are getting longer range,
  - less tactical more strategic Anti-Access/Area Denial (A2AD)