

Advancing Electromagnetic Warfare TOGETHER

**Multi-Function / Multi Domain** 

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**Mission:** 

Advocate - Educate - Support





## 11<sup>th</sup> Americas Cup 1901

#### First Use of Electronic Attack





## 36<sup>th</sup> Americas Cup 2021

#### What If?





# Timeline

- 1980s
  - Stealth
- 1990s
  - Iraq
  - Bosnia
  - WTC
- 2000s
  - **9-11**
  - Afghanistan/Iraq
  - Cyber as a Domain
- 2010-2020s
  - Ukraine
  - Syria













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### Losing the Advantage





"The development and proliferation of more advanced military technologies by other nations means that we are entering an era where American dominance of the seas, in the skies, and in space can no longer be taken for granted" China – Dedicated EW Forces, Long Range Weapons Russia - Ukraine/Syria Dedicated EW Forces Korea – Long Range Weapons



#### 4<sup>th</sup> Industrial Revolution and Future of EW

- For Electromagnetic Operations and EW
  - The threat drives requirements
  - COTS and Moore's Law now greatly influences rapid system development
  - Industrial Espionage reduces time to develop
  - Acquisition needs to move faster & accept more risk
  - Digital Engineering
  - Adaptive Manufacturing Processes
  - Modularity/Open Architectures (Rapidly insert new/best technologies)
  - Cyber Survivable Systems



# **Global Challenges**

- China Expansion
- North Korea Nuclear Threat
- Russian Resurgence
- Iranian Aggression





# What has Changed – Global Connectivity

- Security Innovation Base comes from the private sector
- Components/weapons produced by multi-national coalitions
- Connected Global networks
- Rate of change is increasing
- Asymmetric cost posed by asymmetric threats





# What has Changed - Technology

- Multi-Function supported by ML/AI
- Cognitive, Swarming, Autonomy
- Disrupt, Deny, Degrade, Deceive
  - Non-Kinetic effectors
    - EW
    - Cyber
    - Spectrum Maneuver
- Multi-Function/Multi-Domain using the EME
  - Affecting the Spectrum
  - Protecting the Spectrum





### **Regaining the Advantage**



- Adaptive, cognitive, swarming, multi-function, penetrating
- Cross Domain Command and Control
- Protect our platforms EP and Cyber Survivability
- We operate and fight in the electromagnetic spectrum.... Provide the Commander the ability/option to deliver effects on the Battlefield
  - Kinetic
  - Non-Kinetic (EW, Cyber, DE, HPM)
  - Invest in and develop:
    - Multi-function Arrays
    - Machine Learning
    - Quantum Computing
- Speed up our decision cycle and acquisition cycle
- Train like you fight Multi-National Forces
- Battle Management of the EMS, and EMSO



### Challenges





- **Organization for Multi-National Fight**
- Sensing in the spectrum/data fusion
- Multi-domain Command and Control
- Joint Operations (Air Force, Army, Navy)
- **Multi-National Operations**
- Training
- The Kill Web







### **Kill Chain to Kill Web**





# WWII Aircraft Study – "Survivor Bias"

- US Army Air Force (AAF) wanted Better Bomber Protection
- Data showed a clear pattern, most damage was to the wings and body of the plane
- The solution to their problem was clear, increase the armor on the plane's wings and body
- The analysis was wrong!
- Abraham Wald (Columbia University's Statistical Research Group) reviewed the data
- Missing from the data? Every plane that had been shot down.
- new analysis in hand, crews reinforced the bombers' cockpit, engines, and tail armor.
- When solving a problem, ask yourself if you're only looking at the 'survivors.'
- Your solution might not be in what is there, **but what is missing.**



Credit: Cameron Moll





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