



Electronic Warfare / Electronic Protection (EW/EP) S&T Priority Steering Council

Mr. Jay Kistler

Director Electronic Warfare & Countermeasures Office

Office of the Assistant Secretary of Defense (Research and Engineering)

NDIA 8th Annual Disruptive Technologies Conference

8 November 2011

Distribution Statement A: Approved for public release; distribution is unlimited.

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 08 NOV 2011		2. REPORT TYPE		3. DATES COVERED 00-00-2011 to 00-00-2011	
4. TITLE AND SUBTITLE Electronic Warfare / Countermeasures Office (EW/EP) S&T Priority Steering Council				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Office of the Assistant Secretary of Defense (Research and Engineering), Electronic Warfare & Countermeasures Office, Washington, DC, 20301				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES Presented at the NDIA Disruptive Technologies Conference, November 8, 2011 Washington, DC					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 9	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			



EW/EP Priority Steering Council

Scope & Domain Boundaries within the EMS



Electronic Warfare: Military action involving the use of electromagnetic (EM) and directed energy to control the electromagnetic spectrum (EMS) or to attack the enemy.

Electromagnetic
Spectrum
Management

EP

Protect EM systems
against EM interference

EA

Degrade, disrupt, deceive, & deny
adversary EM system signals,
processing, and C2 functions

DE (EA)

Induced currents
or voltages

ES

Tactical sensing for
real-time response

Cyber Attack

Operations intended to
manipulate adversary info
and/or cyber systems

ISR/SIGINT

Intelligence, Surveillance
and Reconnaissance
gathering systems

PSYOP/MISO

Induce alarms or
failures / influence
ideology

Counter-DE

Protect non-EM system
against EM interference
and DE (Weapon)

C3

Command, Control and
Communications
(voice, data, info)

DE (Weapon)

Thermal / radiation
bombardment



EW/EP Problem Statement



Rapidly evolving challenges to spectrum dominance threaten blue force lethality and survivability

Exacerbating this situation are:

- The asymmetric advantage that lower cost and widespread technology offers our adversaries against our multi-billion \$ investments in military systems,
- The rapid pace of technology advancement leading to increasing potential for technology surprise,
- Pressure for EW operations across all war-fighting domains (air, sea, land, space, and cyber),
- The worldwide availability of advanced technology that is making our adversaries' use of the EMS much more complex and sophisticated, and
- The increasingly congested EM environment



EW/EP Tech Challenges & Desired End States



- **TC1: Cognitive, Adaptive Capabilities**
 - Effectively outpace adversary decision and technical options
- **TC2: Coordinated / Distributed / Network-Enabled Systems**
 - Spatially and temporally diverse responsiveness to dense and complex threat environments
- **TC3: Preemptive / Proactive Effects**
 - Real-time sensing, assessment and optimization of EA effectiveness
- **TC4: Broadband / Multispectral Systems**
 - Widest possible spectral extent to our control of the EMS
- **TC5: Modular / Open / Software-Configurable Architectures**
 - Timely deployment or insertion of advanced EW in response to rapidly changing conditions
- **TC6: Advanced Electronic Protection Techniques & Technology**
 - Allow unfettered operations in the increasingly dense EMS environment



EW/EP PSC Gaps & Opportunities



Game-Changing RF/Mixed Signal Component Technologies

- Agile, high dynamic range receiver electronics
- Agile, wideband transmitter electronics
- Affordable/modular agile beam antennas

Game-Changing EO/IR Component Technologies

- Next generation multispectral IR Focal Plane Arrays (FPAs)
- Multispectral, high power lasers
- Multispectral optics & optical phase control

Underlying technology enablers

- Nitride semiconductor family (GaN/InN/AlN)
- Ultra-precision clocks/oscillators (nsec → psec → fsec)



Broad Agency Announcements



- Industry responses to the grand challenges identified in this brief should engage in dialogue with the PSC leadership
- The following Broad Agency Announcements (BAAs) may also provide an avenue for specific ideas:

Air Force

BAA 09-01-PKS: "Sensor Technology Research, Development, Test & Evaluation Open-Ended Broad Agency Announcement (STROEB) II"

Army

BAA W15P7T-09-R-S152: "United States Army Communications-Electronics Research Development and Engineering Command Intelligence and Information Warfare Directorate Broad Agency Announcement I2WD 2009"

Navy

BAA ONR 12-001: "Long Range Broad Agency Announcement for Navy and Marine Corps Science and Technology"



Summary and Conclusion



- **Electronic Warfare is a critical enabler for Air, Land, Sea, Space, and Cyber operations.**
- **Independent systems- & components-level analyses converged on a short list of long term game-changing tech challenges...**
 - **Cognitive / adaptive capabilities**
 - **Networked distributed coherent systems**
 - **Simultaneous Tx & Rx (STAR)**
- **... enabled by highly linear, agile, high dynamic range, wideband / multispectral Tx & Rx components, precision clocks/oscillators, and active phase controlled apertures**
- **Roadmaps being finalized/configured to achieve an integrated systems and components EW investment strategy**



EW/EP PSC Membership



PSC Lead: Jay Kistler ASD(R&E)
PSC Deputy: Dr. Karl Dahlhauser ASD(R&E)
Air Force: David Hime (Lead), Marv Potts, Dr. Steve Schneider
Army: Dr. Paul Zablocky (Lead)
Navy: Dr. Peter Craig (Lead), Dr. Gerry Borsuk, Dr. Frank Klemm
DARPA Liaison: Chris Earl

RF/Mixed Signal Tiger Team

Dr. Steve Pappert
(Tri-Service Team Lead - Navy)
Dr. Steve Hary (AF Lead)
Dr. Vassilios Kovanis (AF)
Mr. Eric Adler (Army Lead)
Dr. Weiman Zhou (Army)
Dr. Baruch Levush (Navy Lead)
Dr. Jeff Pond (Navy)
Dr. Dave Abe (Navy SME)
Dr. Doug Smith (Navy SME)
Dr. Ron Esman (MITRE SME)
Dr. Phillip Chang (BAH SME)

EO/IR Tiger Team

Dr. Craig Hoffman
(Tri-Service Team Lead - Navy)
Dr. Tom Nelson (AF Lead)
Dr. Robert Bedford (AF)
Dr. Ken Schepler (AF)
Mr. Allan Chan (Army Lead)
Dr. Don Reago (Army)
Dr. Anand Sampath (Army)
Dr. Michael Wrabach (Army)
Dr. Mel Kruer (Navy)
Mr. Ken Sarkady (Navy)