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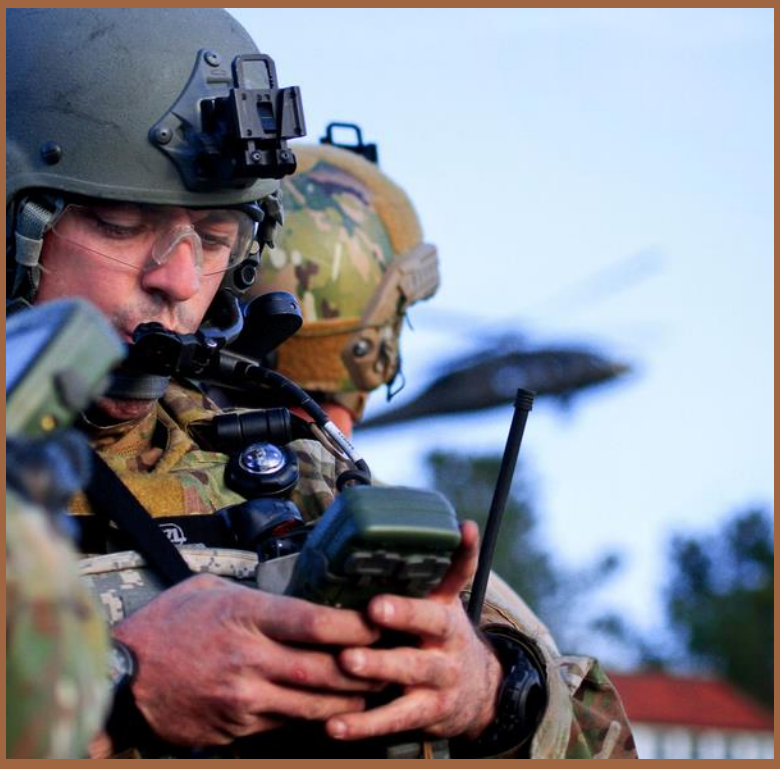
Tactical Staff Considerations for Winning In a Denied, Degraded, and Disrupted Space Operational Environment



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Tactical Staff Considerations for Winning In a Denied, Degraded, and Disrupted Space Operational Environment

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"History is littered with wars which everybody knew would never happen."
Mr. Enoch Powell (1912-1998), former member of the British Parliament

As the U.S. Army prepares for the most lethal end of the range of military operations against known and unknown adversaries, America's primary objective of strategic deterrence remains. Nonetheless, if deterrence fails, most military analysts concur the Army's heavy reliance on space capabilities will be challenged in war and can be viewed as a dual-edged sword. Along one edge, the Army's space capabilities, when properly protected, provide an unmatched and undisputed combat advantage, while on the other edge, near-peers view the Army's space capabilities and reliance on space as a vulnerability which they plan to attack. When the Army's space capabilities are compromised, how they continue to move, shoot and communicate within a denied, degraded, and disrupted space operational environment (D3SOE) will, in part, determine how quickly and efficiently the Army prevails in land combat.

Recall for a moment the devastating impacts Improvised Explosive Devices (IED) had on Soldiers and operations throughout Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF). They caught the Army ill-equipped and untrained to operate within an IED operational environment (OE) -- it was the number one casualty producing weapon employed against U.S. troops, significantly restricted the military's freedom of movement, and required the U.S. to invest tens of billions of dollars in countermeasures ("counter-IED"). The harsh reality was the Army's training readiness, as well as materiel readiness, was insufficient at the onset of these operations to provide a high level of force protection and ability to operate in an IED OE.

The Army has conducted COIN operations over the past 15+ years. After watching and studying military operations, our adversaries refined their ability to maneuver throughout the EMS.

Now imagine a future war against a near-peer adversary. It is likely any one of these adversary's priorities will be to aggressively fight within the electromagnetic spectrum (EMS). The EMS has been referred to as the "*spinal cord of the modern Army"*[1] and the Army who best operates and maneuvers within, protects and weaponizes the EMS, will have the combat advantage. A sobering thought is the adversary's offensive operations within the EMS may have the ability to create the same devastating impacts on U.S. combat formations in a future war as IEDs had in OEF and OIF.

The alarming reality is America's near-peer adversaries have already invested heavily in their force structure, enabling electronic attack (EA) systems ("jammers") and tactics to deny, degrade and disrupt the U.S. military's asymmetric advantages in space. Soldiers' lives, as well as the outcome of the war,

[1] "*Electronic spinal cord of the modern military*" from the Breaking Defense magazine article, January 12, 2017, by Mr. Sydney J. Freedberg Jr. titled, "*Cyber/EW, Aviation, Air Defense, Artillery: CSA Milley's Priorities*".

may very well be dependent on how well the Army recognizes and reacts to jamming against its space-enabled capabilities, as key digital terrain within the EMS is degraded or lost.

This paper discusses the space equities within the EMS, specifically the military's reliance on the Global Positioning System (GPS), satellite communications (SATCOM) and space-based Intelligence, Surveillance and Reconnaissance (ISR) platforms, as well as the corresponding mitigating tasks necessary to retain the Unites States' advantages in space. The ability of the U.S. Army to operate in a D3SOE ensures increased levels of force protection for its Soldiers while preserving its means to deliver devastating effects upon enemy forces.

Space-Enabled Capabilities in the U.S. Army Today

The Army is heavily reliant and the largest user of DOD space capabilities--over 2,500 pieces of space-enabled equipment in a BCT - a target of opportunity!

Over the past 60 years, the Army has been building and fielding its space-enabled capabilities, and over the past 20+ years at the tactical levels, they have been fielding them all the way down to the individual Soldier level. Quantitatively, today the Army conservatively has at least two satellite antennas for every Soldier on the battlefield, connected globally to over 1,450 operational satellites[2] and linked by hundreds of ground stations. A nine-Soldier infantry squad is dependent on up to 150 satellites from five different satellite constellations, and a standard Army Infantry Brigade Combat Team has over 2,500 Program of Record items of space-enabled equipment on its Modification Table of Organization and Equipment (MTOE)[3]. Indisputably, the ways in which the Army shoots, moves and communicates, across each Warfighting Function (WfF), relies heavily on space-enabled capabilities. These reliances include, but are not limited to, Global Navigational Satellite Systems[4] (GNSS) (e.g. GPS), SATCOM and space-based ISR capabilities.

Army Warfighting Challenges (AWfC)

The Army Futures Command Futures and Concepts Center, formerly ARCIC, maintains a list of AWfCs[5] (updated June 01, 2017) which address *"enduring first-order problems, the solutions to which improve the combat effectiveness of the current and future force."* Although many of these 20 AWfCs include operations and capabilities enabled by space, one in specific addresses operating in a D3SOE:

"Warfighting Challenge #7: Conduct Space and Cyber Electromagnetic Operations and Maintain Communications. How to assure uninterrupted access to critical communications and information links (satellite communications [SATCOM], positioning, navigation, and timing [PNT], and intelligence, surveillance, and reconnaissance [ISR]) across a multi-domain architecture when operating in a contested, congested, and competitive operating environment."

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[2] Union of Concerned Scientists (UCS) Satellite Database, updated December 31, 2016. http://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database#.WRNy4f5dDcs

[3] IBCT MTOE equipment, full sets of AN/PSN-13/DAGRs, SATCOM and high frequency radios, target acquisition systems, UASs, FBCB2/JCR/JBC-P force tracking systems and radars.

[4] This term includes the – U.S. owned GPS, the Russian Federation-owned GLONASS, the European Union's Galileo, China's Beidou, and other regional systems.

[5] The U.S. Army TRADOC Army Capabilities and Integration Center (ARCIC) maintains the "*Army Warfighting Challenges (AWfC*)". Updated on June 01, 2017 and can be found at http://www.arcic.army.mil/initiatives/armywarfightingchallenges.

AWfC #7 provides 10 associated "Learning Demands" which challenge commanders to address the problems and associated solutions necessary to train their units how to operate and win in a D3SOE. A few of these Learning Demands include:

- "How can the Army better prepare its leaders and soldiers to operate in a D3SOE?"

- "What are the intersections, overlaps, gaps, and seams between space, cyberspace, electromagnetic spectrum operations, military intelligence, and information operations and how can the Army effectively integrate these operations to support Unified Land Operations?"
- "How does the Army execute Navigation Warfare (NAVWAR)[6], ensuring that Army forces have assured and reliable access to positioning, navigation, and timing (PNT) information while denying the same to our adversaries?"

Space-Related Training Guidance and Training Objectives

There is an ample amount of Joint and Army training guidance available to subordinate commanders to help shape their training priorities and resources to integrate D3SOE requirements into their training plans. Much of this guidance is articulated within the framework of the EMS, cyberspace, and electronic warfare (EW), while other guidance specifically addresses the Space domain.

"Coordinating cyberspace, EW, and space operations enables commanders and staffs at each level to synchronize and integrate capabilities and effects. Space-based capabilities enable distributed and global cyberspace operations. Cyberspace and space-based capabilities provide responsive and timely support from the highest echelons down to the tactical level commander. Coordinating with EW operations is necessary to ensure availability of the EMS and to prevent spectrum conflicts."

FM 3-12, Cyberspace and Electronic Warfare Operations, April 2017

Two current examples include space training guidance from the Chairman, Joint Chiefs of Staff (CJCS)[7] and the Commanding General, U.S. Army Forces Command. The CJCS guidance states, in part,

"The proliferation of threats in the future security environment requires the Joint Force to maintain operational effectiveness while absorbing successful attacks (e.g. loss of force projection assets; degraded Positioning, Navigation, and Timing; space; Command and Control (C2) systems; and reduced access to the electro-magnetic spectrum)."

The FORSCOM Commander's Training Guidance FY19[8] states in part,

"Units must be able to identify, respond to, report, and mitigate threats throughout the Electromagnetic Spectrum (EMS). Units must plan to employ CEMA effects to include Cyber, Electronic Warfare (EW), Space, and Information Operations (IO). Units should expect to operate in degraded or denied electromagnetic operational environment (EMOE) to include voice, digital, GPS and satellite communication capabilities while at a CTC rotation."

Drawing from this guidance, each subordinate commander has the responsibility to develop their own training objectives and integrate, to the greatest extent possible, elements of D3SOE operations into their home station and CTC training requirements. D3SOE training should include classroom and hands-on

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[6] DOD Dictionary of Military Terms and Definitions, dated November 2018

[7] CJCS Notice, 3500.01, "*2017-2020 Chairman's Joint Training Guidance*" dated 12 January 2017.

[8] CG FORSCOM: Command Training Guidance (CTG), FY19, dated 7 August 2018.

instruction, as well as field exercises to stress operations in a D3SOE at the tactical level. The Mission Command Center of Excellence published two individual tasks on 16 May 2017 which are required for every soldier:

150-MC-5903 Recognize Electromagnetic Interference
150-MC-5902 React to Electromagnetic Interference

Examples of specific D3SOE-related training objectives may include:

- Exercise and refine D3SOE-related PACE Plans.
- Exercise and refine D3SOE-related Command Post Battle Drills.
- Rapidly Find, Fix, Finish (lethal) enemy GPS and SATCOM Jammers.[9]
- Plan and execute attacks (lethal and nonlethal) against the enemy's space-enabled capabilities.[10]

Military Decision Making Process (MDMP) and the Commander's Information Requirements

All WfFs must consider space-enabled capabilities and their vulnerabilities throughout all phases of the MDMP[11]. When provided by the Space Support Elements (SSE) (either from higher command or organically), the space estimate[12] provides input into course of action analysis (COA) and informs the development of the commander's information requirements. These information requirements, comprised of Commander's Critical Information Requirements (CCIR)[13] (which includes both Priority Intelligence Requirements [PIR] and Friendly Force Information Requirements [FFIR]) and Essential Elements of Friendly Information (EEFI) typically include language which directly or indirectly addresses D3SOE considerations. Some examples of these may include,
PIR "How I See the Enemy": These information requirements pose questions about the enemy and drive the Intelligence WfF's Information Collection Plan:

- "How will Arianna[14] forces attempt to degrade or destroy our C2, Mission Command capabilities?"
- "What is the enemy's EA Order of Battle (OB)? (Including types of jammers, quantity, capabilities, limitations, unit strengths, disposition/location, employment tactics, intent of jammers, associated indications and warnings, etc.)?"

FFIR "How I See Myself" : These information requirements ask questions the commander needs to know about their own forces and provide direct input into the commander's situational understanding:

- "Report any EMI/enemy jamming of communications, Unmanned Aircraft Systems (UAS) platforms, GPS or Radars."
- "Report loss of critical Mission Command systems (Warfighter Information Network-Tactical [WIN-T], Joint Battle Command-Platform [JBC-P]/Joint Capabilities Release [JCR], SATCOM systems, GPS)."
- "Report loss of critical Intelligence Collection UAS systems (Shadow, Gray Eagle, Raven)."

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[9] U.S. Army TRADOC's *Decisive Action Training Environment (DATE)* v2.2, April 2015 in combination with its *Worldwide Equipment Guide (WEG), Volume 1: Ground Systems*, December 15, 2016.
[10] ADRP 1-03, *Army Universal Task List (AUTL),* October 02, 2015. Army Task (ART) *5.6.2 PROVIDE SPACE CONTROL.*
[11] FM 6-0, Change 1, *Command and Staff Organization and Operations*, dated 11 May 2015.
[12] FM 3-14, *Army Space Operations*, dated August 14, 2014. Chapter 8, Section II – Space Estimate.
[13] ADP and ADRP 5-0, *The Operations Process* (both dated May 2012) describes commander's information requirements which include CCIR (PIR and FFIR), EEFI and running estimates.
[14] U.S. Army TRADOC's *Decisive Action Training Environment (DATE)* v2.2, April 2015 in combination with its *Worldwide Equipment Guide (WEG), Volume 1: Ground Systems*, December 15, 2016.

- "Report degradation or loss of precision engagement capabilities."

EEFI "How I Prevent the Enemy From Seeing Me" [15]: These information requirements are what friendly forces believe the enemy would like to know about U.S. forces and capabilities and provide direct input to Operational Security (OPSEC), Information Operations (IO) and Military Deception (MILDEC) plans and operations.

- "What are the targeting timelines required to lethally target enemy jammers?"
- "How effective are enemy jammers against space-enabled capabilities, systems and munitions?"
- "What are the SATCOM Signals of Interest (SOI) associated with U.S. Army UAS operations and mission command nodes/command posts?"

Space planning is like logistics planning - it needs to be done in advance and across all WfFs

Command Post Battle Drills for Current Operations (CUOPS)

Command post battle drills[16] outline collective and sequential tasks staffs must perform without the application of a deliberate decision-making process, in a time-constrained environment, and with minimal direction or guidance. Battle drills should be developed and tailored to each staff, then trained, rehearsed and refined through exercises. Throughout OIF and OEF a typical division CUOPS employed an average of 40 Command Post Battle Drills. Some recommended battle drills which can be implemented at all echelons may include: GPS EMI, SATCOM EMI, UAS Anomalies, Personnel Recovery, Overhead Persistent Infrared (OPIR), Dynamic/Time Sensitive targeting (especially as it pertains to requirements to physically destroy enemy jammers), and degraded national systems.

PACE Plans (Primary, Alternate, Contingency, Emergency)

Battle Drills and PACE plans must be part of a unit's TACSOP and provide standardized means to rapidly and properly respond to events and conditions on the battlefield

PACE plans are, by their nature, very unit specific and must be developed by their respective WfF, staff element or functional area subject matter experts. They should consider many variables, to include, but not limited to: fielded equipment, training readiness, mission and operational variables such as METT-TC, PMESII-PT[17] and familiarity with the area of interest (AOI). Some PACE plans which should be considered for development include, but are not limited to:

- Communications. The U.S. Army relies heavily on SATCOM as the *Primary* means to move large volumes of data, securely and over great distances. When select SATCOM systems are denied, degraded, or disrupted, alternate SATCOM systems, Line Of Sight (LOS) systems, hard wire/landline, and manual methods (such as runners) should be considered, and practiced.

- Friendly Force Tracking (FFT). Units should consider and train on tracking units using SATCOM/Beyond Line of Sight (BLOS), LOS communications, and analog battle tracking.

- Target Acquisition. Primary target acquisition often involves the use of UASs, national systems, radars, laser designation systems, target coordinate correlation tools and forward observers using SATCOM

[15] FM 6-0, C2, *"Commander and Staff Organization and Operations"*, dated April 2016
[16] ATP 6-0.5, *"Command Post Organization and Operations",* March 01, 2017.
[17] ADRP 1-02, *"Terms and Military Symbols",* dated February 02, 2015

reporting means. In a D3SOE, commanders and staffs should develop PACE plans on how best to detect, geo-locate and report targets.

- Precision Engagement (PE). In a D3SOE, the Fires WfF, through the weaponeering process, should plan to employ multiple types of munitions which provide the greatest accuracies available and achievable. Commanders and staffs should have PACE plans to attain the best precision while operating in a D3SOE.

- Information Collection. Many information collection and Joint ISR assets rely on GPS, SATCOM and national capabilities. As GPS, SATCOM and national systems become denied, degraded or disrupted, commanders and staffs should develop PACE plans on how best to develop and execute their Information Collection Plans[18] to support the commander's PIR in support of Decision Points (DP) and High Value Target Lists (HVTL)/High Payoff Target Lists (HPTL).

- Battle Damage Assessment (BDA). A unit's ability to conduct BDA often relies on UASs and national systems to collect post-strike data. Units should consider other means such as manned aircraft and ground forces to observe and multiple communications means to report data to higher HQ.

Fires Options for Commanders

The development and maintenance of the space running estimate[19] [20], to include maintaining a current enemy space order of battle, provides the commander with offensive options and effects to attack the enemy's use of space, as well as the enemy's ability to attack the Army's use of space. These targeting options[21] consist of lethal and nonlethal effects[22] to shape and control the EMS to the commander's advantage. Enemy targets commanders may consider for lethal attack may include physical ground-based systems and capabilities such as tactically-employed systems or strategic-level control facilities.

"Fighting space" includes traditional "calls for fire"

Other targets commanders may consider for nonlethal attacks may include means to deny, degrade or disrupt the portions of the EMS[23] used for PNT (such as GPS and/or Global Navigational Satellite System [GLONASS]) and SATCOM, especially those associated with force tracking, UASs, mission command, and precision engagement capabilities and operations.

Requests for D3SOE Training Support

Brigade and below level units should contact their higher command's SSE for D3SOE training and/or training support. SSEs at division, corps and ASCC headquarters requesting training support should exercise their chain of command up through the Combatant Command's Space Coordinating Authority (SCA). Additionally, units may contact the USASMDC/ARSTRAT G37 Training, Readiness and Exercises (TREX) Division, Army Space Training Integration (ASTI) Branch at (DSN 692) 719-554-8773/1922 to discuss training opportunities, resources, and requirements or to provide comments on this article.

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[18] ATP 2-01, *Plan Requirements and Assess Collection*, August 19, 2014.
[19] FM 3-14, *Army Space Operations*, dated August 14, 2014. Chapter 8, Section II – Space Estimate.
[20] JP 3-14, *Joint Space Operations*, dated May 29, 2013, Chapter III, Section 4, Theater Space Network.
[21] ATP/FM 3-60, *Targeting*, dated May 07, 2015.
[22] ADRP 1-03, Army Universal Task List (AUTL), dated October 02, 2015, *ART 3.2.1 EMPLOY FIRES*
[23] ADRP 1-03 *Army Universal Task List*, October 02, 2015. Army Task (ART) 3.1.4 "Nominate Electronic Attack Effects on Targets."

D3SOE training is critical to the success of mission planning and execution, and is readily available via Division/Corps SSEs and USASMDC/ARSTRAT

Takeaway Questions

1. What are the space and space-enabled systems your unit currently possesses (MTOE as well as non-Program of Record/local/commercial purchases)?
2. How well do the operators and staffs of your unit understand how each space and space-enabled system behaves when exposed to EMI (e.g. How do they recognize EMI: system performance is degraded, system provides visual/audio alarms, munitions failures, UASs return to base (RTB), etc.)?
3. Do Soldiers and G/S-6 staff understand the importance of and requirement for loading COMSEC into space-enabled equipment (e.g. DAGR)? Is there a mechanism to track equipment which requires a COMSEC fill, and is it being accomplished IAW unit SOP?
4. How well is your unit trained to operate and win in a D3SOE (e.g. individual and collective space training and education already provided as well as TACSOPs containing appropriate PACE plans and Battle Drills which consider D3SOE to allow units to properly react to EMI and other factors that may degrade their use of space)?
5. What training gaps currently exist within your unit regarding D3SOE training readiness?
6. What D3SOE training and training resources do you require (for home station training and/or in preparation for an upcoming CTC rotation or WFX and/or upcoming operational deployment)?