Beyond the Grid

The Impact the Operational Environment Has on Artillery

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The Impact of the Operational Environment on Operations

The Operational Environment (OE) is a critical planning factor requiring careful consideration. During Large Scale Combat Operations (LSCO), a thorough understanding of the OE is imperative for the successful employment of artillery, enabling commanders to maximize lethality while minimizing risks to personnel and equipment. A clear grasp of the OE's capabilities and limitations is critical for developing artillery placement plans for both friendly and enemy forces. To establish this foundation, the process of Intelligence Preparation of the Operational Environment (IPOE)—defined as "the systematic process of analyzing the mission variables of enemy, terrain, weather, and civil considerations in an area of interest to determine their effect on operations (ATP 2-01.3)"—is necessary. This deliberate approach ensures commanders can make informed decisions by leveraging the OE to their advantage, ultimately increasing the effectiveness of artillery operations.

The absence of a detailed, four-step IPOE process can leave commanders without a clear understanding of the operational environment, essentially "operating in the dark." To illustrate the significance of a systematic approach, consider the classic game of "Battleship." Players attempt to sink each other's ships by guessing their locations on a grid divided into rows and columns with unique coordinates. As players strategize and adapt their approach based on gathered information, they mirror the Fire Support community's iterative process of identifying enemy Position Areas for Artillery (PAAs). Just as a skilled "Battleship" player combines strategy and adaptability, the Fire Support community relies on a defined process to gather and analyze critical information, enabling them to locate enemy PAAs and gain a decisive advantage.

As IPOE development progresses, staff often ask: how can we successfully implement this at the National Training Center (NTC)? The answer came through an instructive article titled "Probable Position Areas for Enemy Artillery at the National Training Center" by CPT Jason E. Martos. From the perspective of a Battalion S2, CPT Martos' realistic approach clearly delineated the "art" and "science" of analyzing enemy PAAs, considering crucial Operational Environment (OE) factors such as slope, hydrology, lines of communication, and intervening crests. Utilizing the topographic capabilities of the Distributed Common Ground System (DCGS), an ArcGIS-based platform, CPT Martos' approach fostered a shared understanding for analysis. The 1st Armored Brigade Combat Team (1ABCT) "Ready First" adopted this framework, managing it at the Brigade's Mission Support Site (MSS), where the Field Artillery Intelligence Officer (FAIO) and Brigade Geospatial Engineering Technician collaborated to create and refine PAAs based on evolving intelligence.

Case Study: National Training Center Rotation 24-04

Applying the insights from CPT Martos' article, the collaboration between the 1ABCT "Ready First" Geospatial Information System (GIS) and Brigade Fire Support Element (FSE) during NTC Rotation 24-04 yielded impressive results. Together, they developed a Heat Map that enhanced the ability of fires to plan and execute missions effectively, providing

Ships assigned to the U.S. 5th Fleet sail in formation for a photo exercise during an underway in the Arabian Gulf. Tempest is deployed to the U.S. 5th Fleet area of operations in support of naval operations to ensure maritime stability and security in the Central Region, connecting the Mediterranean and the Pacific through the Western Indian Ocean and three strategic choke points. ***(U.S. Army photo by Spc. Eric Cerami)***

critical analysis and predictive insights into enemy locations and the terrain's impact on operations. Initial products feeding the Heat Map were based on the 7% slope requirement for the M109A7 Paladin, utilizing Light Detection and Ranging-based elevation data (LiDAR BE) to inform the analysis. As the exercise progressed, the Counterfire Officer and FAIO refined these products, ultimately delivering comprehensive PAA site suitability analyses.

To create the PAA site suitability analysis, a multi-step process was employed that integrated various data sources and spatial analysis techniques. The methodology included the following steps:

1) The analysis began with the NTC "Ready First" Special map, a 36" x 52" map at a 1:50,000 scale, created by the 1ABCT GEOINT Team using ArcGIS Pro. This map provided a comprehensive overview of the NTC training area, including the Fort Irwin Cantonment area.
2) Digital Terrain Elevation Data (DTED) level 2 tiles covering the NTC area were acquired and ingested into ArcGIS Pro. The slope tool was used to conduct a slope analysis with a 7% slope parameter, identifying areas that could and could not be emplaced by M109A7 Paladins.
3) The Main Supply Routes (MSR) layer from the NTC "Ready First" Special map was extracted and a 750m buffer was applied using the Buffer Tool in ArcGIS Pro. This step identified areas that were at a minimum distance of 750m from any MSR.
4) No Fire Area (NFA) and No Strike List (NSL) data were received from the BDE FSE in Microsoft Excel spreadsheets, which included MGRS grids and area distances for each NFA. The data was integrated into the analysis using the following steps and tools in ArcGIS Pro:
   - Excel to Table: spreadsheets were converted into tables
   - Table to Point: tables were converted into point features
   - Corresponding buffers were created for each NFA area category, ranging from 25m to 1000m, based on the type and size of the NFA.
5) By simultaneously displaying the Combined Obstacle Overlay (COO), 7% slope analysis, MSR buffer, NSLs, and NFA buffers, areas suitable for potential PAA locations were identified. The final steps involved measuring PAA locations within these suitable areas and categorizing them into 2km² and 3km² areas. This was accomplished by:
   - Creating a new area feature class in the working GEO dataset within the geodatabase
   - Using the Create Tool in the Edit tab within ArcGIS Pro to measure PAA locations
   - Utilizing established grids, which were already 1km grid squares, and supplementing with ArcGIS Pro's Measure Tool as needed
   - Symbolizing the two PAA categories using the Symbology function, with amethyst representing 2km² PAA locations and poinsettia red representing 3km² PAA locations.

After consolidating all data onto the 1ABCT "Ready First" map, we identified over 200 potential artillery positions for both friendly and enemy forces. Integrating this data with the S2's Named Areas of Interest (NAIs) and known Points of Origin (POOs) and Points of Impact (POIs) enabled the Counterfire cell and FAIOs to begin planning proactive counterfire operations.

Proactive Counterfire with Predictive PAAs

Recognizing the consistent counterfire challenges faced by units at the NTC, we leveraged insights from CW2 David Brown's article, "Counterfire Trends from NTC," to focus on key areas for improvement: strengthening collaboration with Brigade S2s during IPOE, diversifying methods for locating enemy artillery beyond Q-53 radar, improving understanding of permissive Fire Support Coordination Measures (FSCMs), and accelerating reactive counterfire capabilities.

Understanding that a successful NTC rotation requires a willingness to experiment and learn, NTC 24-04 provided a valuable opportunity to put these improvements into practice. Directly connecting the Q-53 quick-fire net to C Battery proved particularly effective, significantly reducing mission processing times—with the fastest time recorded at 7 minutes and 18 seconds, and an average of approximately 13 minutes and 20 seconds. This faster processing enabled rapid analysis of potential PAAs and dissemination of critical information to the FAIOs and the Counterfire Officer.

Collaborating closely, the FAIOs and Counterfire cell developed a comprehensive heat map, enabling them to conduct pattern analysis and uncover additional Tactics, Techniques, and Procedures (TTPs) employed by the enemy. This intelligence informed a thorough review of Call for Fire Zones (CFFZs) and Artillery Target Intelligence Zones (ATIZs) by the Targeting Working Groups, revealing key changes and gaps that ultimately enhanced the effectiveness of 1ABCT's targeting efforts and counterfire operations.

Challenges and Lessons Learned

NTC 24-04 posed a significant challenge due to the physical separation of key nodes. The Mission Support Site (MSS), located in a secure sanctuary at Santa Fe, served as the hub for intelligence support, with the Brigade Intelligence Support Element and Field Artillery Intelligence Officers (FAIOs) operating from this location. However, the Main Command Post (MCP) was situated in the box, with the Counterfire Cell functioning independently. This disparate arrangement created a disconnect between the FAIOs and the Counterfire Cell, resulting in notable intelligence gaps and resource constraints, such as:

- The MCP and MSS duplicated targeting efforts, where multiple units inadvertently targeted the same enemy position, wasting valuable resources and potentially compromising operational effectiveness.
- The MCP had inadequate analysis, stemming from limited access to critical information and expertise, which hindered the ability to provide timely and accurate intelligence support.
- The MSS identified resource constraints, which further hindered challenges faced by the FAIOs and the Counterfire Cell, limiting their ability to effectively collect, analyze, and disseminate intelligence.
- The MCP had restricted access to information, which created a significant obstacle to providing effective support to artillery operations, as critical intelligence was often unavailable or arrived too late to be of operational value.

The distribution of intelligence products and information was also hindered, with critical data often arriving too late to inform decision-making or support operational planning. This lack of timely and effective intelligence support had a direct impact on the ability of the FAIOs and the Counterfire Cell to work together seamlessly, ultimately affecting the overall effectiveness of artillery operations.

Conclusion

The OE is critical to LSCO. A thorough understanding of the OE, achieved through IPOE, enables effective artillery employment. Effective information dissemination is key to success—asking "who else needs to know" ensures critical intelligence is shared with the right people at the right time. In artillery operations, this means gathering, analyzing, and disseminating information quickly to inform targeting efforts and counterfire operations. A systematic approach to IPOE, as demonstrated during National Training Center Rotation 24-04, can enhance the effectiveness of fires and achieve operational success. By prioritizing information dissemination and ensuring intelligence is shared effectively, commanders can make informed decisions and optimize artillery placement.

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