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Network-Centric Operations Case Study

The Stryker Brigade Combat Team

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Summary

The Stryker brigade is one of the newest units in the U.S. Army. Intrinsic to the design of this unit are digital communications networks and battle command systems, a new force design, and a medium-weight wheeled vehicle with unique speed and stealth characteristics. The Stryker brigade has several important new elements related to Network-Centric Operations (NCO), including its new operational concept, its organizational structure, and its networking capabilities. The Stryker brigade organizational structure is designed to gain and exploit an information advantage by conducting NCO. It utilizes an information-centric concept of operations with elements that bear a striking resemblance to some of the concepts found in NCO theory—as defined in the NCO Conceptual Framework (NCO CF) developed by the Office of Force Transformation (OFT) and Office of the Assistant Secretary of Defense for Networks and Information Integration (OASD [NII]).[1]

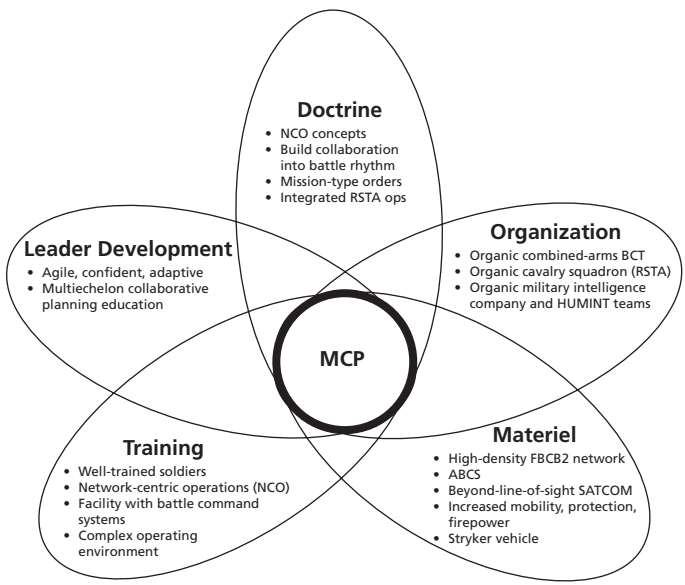
The Stryker Brigade Combat Team (SBCT) possesses an innovative organizational structure. It has an embedded reconnaissance, surveillance, and target acquisition (RSTA) squadron, an organic military intelligence company, and other features that make it capable of generating its own situational awareness data and quickly fusing

[1] The NCO CF is described in Signori et al. (2002); Evidence Based Research, Inc. (2003); and Signori et al. (2004). Major concepts of NCO are described in Alberts, Garstka, and Stein (1999) and Alberts and Garstka (2001).

this data to generate high-quality situational awareness information and understanding.

As illustrated in Figure S.1, these elements of the SBCT, doctrine, organization, materiel, training, and leader development, have been integrated by the Army to form what has been termed in the NCO literature to be a mission capability package (MCP) (Alberts, 1995). The concept of an MCP is discussed in detail later in this report. Here we point out that an MCP is more than a collection of warfighting capabilities. It includes the doctrine, organization, training, materiel, leadership, personnel, and facilities (DOTMLPF) elements, shown in Figure S.1, that are necessary to effectively employ the NCO capabilities potentially inherent in the digital networking and battle command systems also listed in the figure. Sometimes it is the nonmateriel elements of an MCP that are the most important.

Figure S.1
Stryker Brigade NCW MCP Overview



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The SBCT is equipped with the current generation of Army digital terrestrial and satellite communications systems and evolving current battle command systems. These systems have limitations described later in this report.[2] In other words, the Stryker brigade network and battle command systems are far from perfect. Nevertheless, they can provide significantly more information if employed effectively, and, as we shall see later in this report, higher-quality information than that available to soldiers and commanders of analog, nondigitized units.

These same digital systems have been fielded in other digitized heavy armor units in the Army. In contrast, what is unique in the case of the Stryker brigade is that the organizational structure of the unit has been changed to leverage these new digital systems. These organizational changes are central to the MCP concept and are intended to improve the SBCT's ability to both rapidly generate and share information to develop shared situational awareness and understanding and to act decisively to exploit this increased situational awareness and understanding.

Objective

The objective of this study is twofold: first, to understand the extent to which NCO capabilities are a source of combat power for the Stryker brigade and second, to determine the extent to which the tenets of the NCO hypothesis are realized by this new type of unit.

The original Network-Centric Warfare (NCW) hypothesis posits the following relationships between twenty-first century information technologies, information sharing, and warfighting capabilities:

- "A robustly networked force improves information sharing

[2] We only note here that the Army is addressing these limitations.

- Information sharing enhances the quality of information and shared situational awareness
- Shared situational awareness enables self-synchronization and enhances sustainability and speed of command
- These, in turn, dramatically increase mission effectiveness." (Alberts and Garstka, 2001.)

The NCO CF developed by OFT and OASD (NII) provides a more detailed and precise elaboration of the NCW hypotheses.[3] It includes NCO measures and hypotheses for how these measures relate to and influence each other. The result is an interlinked set of NCO capabilities that, in combination, potentially can lead to improvements in overall military force effectiveness. Importantly, the NCO CF describes subsidiary metrics for assessing NCO capability measures, making it possible to determine whether and how possession of a particular NCO capability may relate to improvements in other NCO capabilities, and ultimately in force effectiveness.

Study Scope and Context

The scope and context for this study are in part determined by the original strategic mission context defined for the Stryker brigade by the Army when the brigade was created several years ago.

> We must provide early entry forces that can operate jointly, without access to fixed forward bases, but we still need the power to slug it out and win decisively. Today, our heavy forces are too heavy and our light forces lack staying power. We will address those mismatches. (Shinseki, 1999.)

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[3] Please note, however, that NCW can be construed to apply only to warfighting operations, while NCO does apply to a broader array of operations that military forces can undertake, such as peacekeeping and stability and support operations. We use the terms NCO and NCW interchangeably in this report.

General Eric Shinseki, the former Army Chief of Staff, recognized the need for a new medium-weight brigade-size force capable of joint ground maneuver operations. His vision led to the creation of the Stryker brigade.

The Stryker brigade and the Stryker wheeled vehicle were designed to be rapidly deployable by airlift and sealift. These vehicles were designed to enable a light infantry force to maneuver rapidly on the battlefield to positions of tactical advantage.

In some quarters, the Stryker brigade is controversial. It is alleged this unit may not be well suited for certain operations and threat environments. Much of this controversy surrounds the Stryker combat vehicle, which is unique to this brigade in the U.S. Army. The focus of this study is not the vehicle and its capabilities or limitations. Rather it is on the information component or NCO capabilities of this unit that include the SBCT's RSTA capabilities, its networking and battle command systems, and its other information systems.

Critics of this new force design and this new vehicle have pointed out that the vehicle without advanced armor appliqués is vulnerable to medium-caliber weapons and rocket-propelled grenades (RPGs) that may be carried by insurgents and opposing infantry forces. These critics call into question the survivability of the Stryker vehicle against heavy armor opponents as well as enemy light infantry. It is not the purpose or intent of this study to address these issues concerning the survivability of the Stryker vehicle. Here, we wish only to point out that the Army is working to reduce the vulnerability of Stryker vehicles to medium-caliber weapons and RPGs by adding caging to the exterior of the vehicles to trap and detonate RPGs and by adding additional armor to the vehicles themselves. It is also important to point out that the SBCT was never designed to fight directly and alone against a heavy armor force for an extended period of time. It is designed for smaller-scale contingencies (SSCs) against smaller and lighter-weight opponents. In summary, our focus is not on the vehicles. Instead, in this analysis, we endeavor to take a

network-centric MCP approach and assess the unit's performance overall and not that of individual vehicles.

It is difficult to select a baseline unit to use as a comparison to the Stryker brigade because currently no nondigital medium-weight brigade exists within the U.S. Army. Therefore, one must choose as a baseline a light or a heavy armor brigade (either a U.S. brigade or one that is appropriately equipped from an allied nation). If one takes into account the strategic context for which the Stryker brigade was designed (rapid-deployment/rapid-response operations), then one can only choose a heavy armor brigade as the baseline if the heavy armor equipment were prepositioned afloat near the theater of operations.

Because this case study needs to be consistent with the original SBCT strategic mission context described above and because reliable unit performance data for both the Stryker brigade and a baseline unit in an SSC scenario was available only for unit rotations at the Joint Readiness Training Center (JRTC), we selected the closest predecessor unit to the SBCT to be a U.S. light infantry brigade (a unit that can be rapidly deployed to any theater of operations regardless of the location of the theater). Consequently, the baseline unit we compare the Stryker brigade to is a U.S. light infantry brigade in an SSC scenario that is used at the JRTC.[4] In addition, because we wish to understand the role and possible advantages NCO capabilities may have in ground warfare, we compare the Stryker brigade to a nondigitized light infantry unit.[5]

In summary, we compare the Stryker brigade to a nondigitized light infantry brigade and believe such a unit is the closest predecessor unit and best baseline for comparison because of the following reasons:

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[4] Because of time and resource constraints, we did not do an exhaustive search for other suitable baseline units among the military forces of allied countries.

[5] Most, if not all, Army light infantry units are not digitized at the present time.

- The SBCT conducted a structured Certification Exercise (CERTEX) at JRTC. This provided us the best possible available data regarding the SBCT's use of NCO capabilities.
- We want to control for other factors, such as the type of scenario, the enemy composition, and the type of terrain, and therefore wanted to compare the SBCT vis-à-vis other units that conduct JRTC rotations—e.g.., light infantry brigades.
- Both the SBCT and light infantry brigades train at SSC scenarios at the JRTC, and the SBCT is tailored for conducting operations in SSCs.
- The SBCT was originally designed to sometimes replace light infantry brigades in rapid deployment missions where greater mobility and firepower is necessary. Thus, we decided that comparing the SBCT to the organization it could replace (light infantry brigades) for some operations was best.
- The Marine Expeditionary Brigade has light infantry vehicles, but the organization, doctrine, training, and materiel factors are significantly different from those employed by the Stryker brigade.

The specific scenario we utilize as the point of comparison is one used at training rotations of light infantry brigade units at the JRTC for several years. In particular, we focus on the culminating tactical engagement such units execute at the JRTC during their operational evaluation, the brigade attack at the Shughart-Gordon urban training site.

It is important to note that the Stryker brigade JRTC scenario was more stressing in some respects for the Stryker brigade than has been typically encountered in the past at the JRTC by light infantry brigades. Like a light infantry brigade, the Stryker brigade was called on to rapidly deploy into contested territory, become combat ready quickly, rapidly maneuver once on the ground, and engage in offensive operations against an enemy light infantry force holding a key objective, the city of Shughart-Gordon. In contrast, unlike a light

infantry brigade, the Stryker brigade was tasked to execute additional simultaneous offensive, defensive, stability, and support operations in several other noncontiguous areas.

Because the focus of this report is on the NCO capabilities of the SBCT and not on the Stryker vehicle, we examine a broader range of measures of effectiveness. We of course consider overall force effectiveness and force survivability measures. In addition, we employ measures included in the NCO CF to measure the information component of the Stryker brigade. Some of the key NCO measures we employ are measures of networking capability, the quality of situational awareness information, quality of interactions and collaboration, speed of command, quality of decisions, and force synchronization.

Findings

We examined the inference chains of the NCO hypothesis and the NCO CF from the context of Stryker brigade doctrine. Our investigation revealed that the Stryker brigade has been designed with NCO capabilities in mind and is an NCO-enabled MCP. Even though the Army does not express its doctrine in terms of NCO concepts, as described later in this report, Stryker brigade operational concepts and doctrine bear a close resemblance to the NCO concepts that have been under development and study in the Office of the Secretary of Defense (OSD).

We found that the Stryker brigade is a significantly more agile and capable combat force than its closest predecessor unit in similar operations at the JRTC.

Our analysis reveals that several key NCW factors contributed to an order-of-magnitude increase in the Stryker brigade's force effectiveness in the JRTC CERTEX.

The key NCO materiel improvements were:

- 75 percent or more of SBCT combat vehicles have networked battle command systems[6]
- High bandwidth beyond line of sight satellite communications (SATCOM) links are used to connect command and control (C2) centers at the brigade and battalion levels.

These NCO materiel improvements lead to significant NCO capability and force effectiveness improvements as shown in Table S.1.

These SBCT NCO capability enhancements include a significant improvement in shared situational awareness for soldiers in the SBCT compared to the quality of the situational awareness information typically available in a baseline unit. Another key result is acceleration in the speed of command (i.e., the time used to make key decisions by brigade commanders) that we measured to decrease from 24 hours (for a typical baseline unit) to three hours for the Stryker brigade.[7]

Table S.1
Comparison of NCO Capabilities and Unit Force Effectiveness

	Light Infantry Brigade	Stryker Brigade
Quality of individual and shared information[a]	~10%	~80%
Speed of command	48 hours	3 hours
Ability to control the speed of command	No	Yes
Blue:Red Casualty Ratio	10:1	1:1

[a] "Quality of situational awareness information" is defined as the percentage of actual enemy, neutral, and friendly forces that are correctly identified and accurately located by the commanders and soldiers or by their information system in each unit.

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[6] Note that the percentage of Stryker combat vehicles equipped with networked battle command systems in the fully equipped SBCTs is now higher than 75 percent.

[7] Speed-of-command estimates were determined by reconstructing the time line for key events and decisions from after-action reports, observer controller observations, and interviews with Stryker brigade commanders.

It is important to note that Stryker brigade doctrine is designed to exploit these NCW capabilities. The result for the Stryker brigade in its CERTEX was a significant improvement in force effectiveness and survivability in the culminating tactical engagement at the JRTC, as illustrated in Table S.1.

The following comments by JRTC observer controllers who witnessed the SBCT CERTEX corroborate our assertion that the SBCT's NCO capabilities made a significant contribution to the observed increase in force effectiveness.

> The most impressive capability demonstrated by the SBCT was the ability to affect the enemy's decision cycle through [situational awareness/situational understanding] combined with mobility and lethality. The best example of this was during the Shughart-Gordon urban attack operation.[8]

> The [situational awareness/situational understanding] afforded platoon leaders and commanders by the lower [Tactical Internet] and FBCB2 [gave them] the ability to maneuver their forces and close with and destroy the enemy during urban operations in Shughart-Gordon.[9]

> Observing 24 units attack Shughart-Gordon as a JRTC [observer controller], I have never seen a unit clear every building and still retain combat power to defeat an enemy counterattack.[10]

Caveats

Some important caveats should be kept in mind that apply to these results. First, this case study considers one particular case. We consid-

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[8] JRTC senior observer controller comments.

[9] JRTC senior observer controller comments. Note that FBCB2 means Force XXI Battle Command Brigade and Below.

[10] Observer in the Operational Evaluation Control Group.

ered one SBCT rotation at the JRTC and one tactical engagement, the attack at Shughart-Gordon that light infantry units have for years been trained on. Nevertheless, we believe this is a good "data point" because this JRTC vignette is carefully designed, is well instrumented, and was observed by experienced observer controllers. It demonstrates the potential of NCW capabilities in the Stryker brigade.

Second, many factors contributed to the success of the Stryker brigade in this case study, such as the Stryker vehicle's mobility, which allowed the infantry soldiers to arrive fresh for battle instead of walking 25 kilometers while fighting enemy forces in ambushes in difficult terrain. The Stryker vehicle also provides more firepower than light infantry units typically have. However, it is not clear that this firepower was a dominant or even an important factor in the engagement. We do know the vehicle was used effectively as protection against enemy fire. It was not possible to attribute the observed increase in force effectiveness to a single variable—the capabilities of the information network or the capabilities of the Stryker combat vehicle. Thus, we attribute the significant improvement of overall unit force effectiveness to the entire MCP, as defined in Figure S.1. While it is not possible with the data available to isolate and quantify the contribution of the information component of the Stryker brigade to the overall force effectiveness of the SBCT, as discussed in detail later in this report, we believe the information component of the Stryker brigade to be essential to its overall success because changes in C2 processes, the new information-centric concept of operations, and the acceleration in the speed of command are key elements in how the Stryker fights and operates.

Finally, there is an additional caveat with regard to the data on which this report is based. In this particular case study, we had access to data from multiple and in some cases dissimilar sources for the different units whose performance we assessed. This study was also conducted under tight timelines to meet the sponsor's needs, which prevented us from carefully designing data-collection strategies and

scheduling data-collection opportunities with specific units. Because of this, we had to make the best possible use of the data already available from recent exercises in which light infantry or Stryker brigades participated. In addition, because of this, we compiled interview data taken from independently conducted surveys of unit commanders for different exercises. We did not have control over the data-collection approaches used in these prior studies or operational evaluations. Nevertheless, we have made every effort to ensure that data collected from different exercises and dissimilar sources are used in a credible and analytically correct fashion.

Implications for the Future

We have reason to believe that current results for the SBCT might underestimate the potential of more robust NCW capabilities in future land warfare. The current Stryker brigade information network is based on legacy communications systems that supply limited bandwidth and have limited range on the battlefield (many tactical Internet [TI] links are terrestrial line-of-sight links that have limited range, especially in complex terrain or high-foliage environments). The limitations of the current Stryker brigade TI were noted at the JRTC. An interim solution for these shortcomings has been found for the Stryker brigade currently deployed in Iraq. This unit is now equipped with 11 SATCOM very-small-aperture terminals (VSATs) to reduce the brigade's reliance on vulnerable ground-relay sites and to enable parts of the brigade to operate at greater distances from one another, consistent with Stryker brigade operational concepts.

However, this short-term solution should not cause neglect of important long-term initiatives that can provide even more robust NCO capabilities in the future. The Joint Tactical Radio System (JTRS) and the more capable and secure high-capacity SATCOM VSATs of the Warfighter Information Network–Tactical (WIN-T) program will significantly improve the networking and collaboration

capabilities of future digitized Army forces, including those of the Stryker brigade.

Another important area highlighted by SBCT units is training and personnel stabilization. Effective use of the current suite of applications in the Army Battle Command System (ABCS) requires well-trained, proficient soldiers and commanders. JRTC observer controllers estimate that a fully combat ready and cohesive Stryker brigade could achieve a 1:2 casualty ratio against the opposing force (OPFOR) at the JRTC in the same tactical engagement if SBCT soldiers were fully trained in all aspects of combined-arms warfare and with all aspects of ABCS.

Finally, the Stryker brigade may offer additional insight into what NCO capabilities can provide future U.S. Army, U.S. Marine Corps, and allied ground forces. The organizational structure of the Stryker brigade was designed around a new, information-centric operational concept. These new organizational and operational concepts may provide useful starting points for the operational concepts and organizational structures that will one day be used by Future Combat Systems (FCS)–equipped Army forces.