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An Investigation of ISR Coordination and Information Presentation Strategies to Support Expeditionary Strike Groups

Track 5: Organizational Issues
Track 1: C2 Concepts, Theory, and Policy
Track 7: Network-Centric Experimentation and Applications

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Abstract

This paper describes a planned experiment based on the combined research of the Adaptive Architectures for Command and Control (A2C2) and the Command-21 programs, both of which are sponsored by the Office of Naval Research. In line with the theme of this year's symposium, "Adapting C2 to the 21st Century," in this research we focus on the nexus of organizational design and information presentation strategies — both of which are undergoing dramatic changes in form and function within the US military. The formation of Expeditionary Strike Groups (ESGs) provides one example of the transformational vision provided in the Naval Operating Concept where Strike Groups offer the potential to revolutionize naval warfare in the littoral region. The ESG provides a flexible force package, capable of tailoring itself to accomplish a wide variety of mission sets. In this effort, we seek to explore how ESGs with alternative structures and processes, in this case specifically related to incorporation of an intelligence, surveillance, and reconnaissance (ISR) officer and different information presentation strategies, can affect performance and information flow in an information rich planning and execution environment.

Research Summary

In this research we focus on the nexus of organizational design and information presentation strategies — both of which are undergoing dramatic changes in form and function within the US military. In particular, the formation of Expeditionary Strike Groups (ESGs) provides one example of the transformational vision provided in the Naval Operating Concept (2002) where Strike Groups offer the potential to revolutionize naval warfare in the littoral region. The ESG provides a flexible force package, capable of tailoring itself to accomplish a wide variety of mission sets.

This paper describes a planned experiment based on the combined research of the Adaptive Architectures for Command and Control (A2C2) and the Command-21 programs, both of which are sponsored by the Office of Naval Research. These research programs enjoy a long history in their respective areas: A2C2 in model-based experimentation to design adaptive organizations for the US military (Diedrich, Hocevar, Entin, Hutchins, Kemple, and Kleinman, 2002; Entin, Weil, Kleinman, Hutchins, Hocevar, Kemple, and Serfaty, 2004; Hocevar, 2000; Hutchins,

Kleinman, Hocevar, Kemple, and Porter, 2001; Hutchins, Kleinman, Hocevar, Kemple, 2005; Weil, Kemple, Grier, Hutchins, Kleinman, Hocevar, and Serfaty, 2006) and Command-21 that studies ways to organize and display information to support decisionmaking within the military (Moore, Schermerhorn, Oonk, & Morrison, 2003; Oonk, Moore, & Morrison, 2004; Oonk, Smallman, & Moore, 2001).

An Expeditionary Strike Groups (ESG) presents a new way of organizing Navy and Marine Corp assets and personnel to accomplish a broader range of missions. A joint Navy and Marine Corps Naval Operating Concept (2002) describes a transformational vision for the future employment of US Naval forces, which includes the development of ESG, Carrier Strike Group (CSG), and Expeditionary Strike Force (ESF) organizational constructs (Callahan, 2005). Operational deployment of these newly formed units began in 2003. This realignment of naval assets under the Strike Group concept provides the Amphibious Squadron/Marine Expeditionary Unit (PHIBRON/MEU) with significantly more offensive and defensive capability. ESGs are currently undergoing proof of concept testing and are deployed under three different command arrangements to test and validate the best C2 construct for the organization.

In this effort, we seek to explore how ESGs with alternative structures and processes, in this case specifically related to incorporation of an intelligence, surveillance, and reconnaissance (ISR) officer and different information presentation strategies, can affect performance and information flow in an information rich planning and execution environment. A question of interest is: "How do the C2 responsibilities of the information officer affect the organization in terms of (*i*) resource allocation, (*ii*) coordination efficiency, and (*iii*) performance/ execution of the mission?" A second question asks how these factors change with different information sources, e.g., in terms of efficiency of resource allocation, coordination, and communication patterns. For example, are there fewer requests for information when a tool that structures the information space is used? Does that change with the levels of the information officer? Our focus for information presentation strategies is inspired by network-centric warfare concepts, to facilitate performance in both planning and execution.

Experimental Design

A 3 x 2 mixed experimental design will be employed with several six-person teams, each split into two triads of decisionmakers (DMs). One triad will be concerned with current operations ("executors"), while the other triad will be concerned with future (24-72 hr) planning. Our first independent variable is the presence/non-presence of an ISR officer at three levels. Level 1 has *no single person* responsible for coordination of assets — the responsibility for ISR coordination is diffused. At level 2 an *ISR Coordinator* is responsible for pushing/ pulling information among the participants and for coordinating use of ISR assets based on the Commander's Intent. Level 3 involves an *ISR Commander*, who has the same responsibilities as the ISR Coordinator and, additionally, owns all primary ISR assets and allocates them on case by case basis.

The three levels of the first independent variable are depicted on the continuum below that extends from one end where ISR asset coordination is accomplished in a self-synchronized manner, i.e., the various players deciding amongst themselves how best to employ these scarce resources, to the ISR Coordinator, who coordinates ISR asset use by managing the information flow between all players but does not control ISR assets, to the ISR Commander, who in addition

to managing the flow of information and directing use of ISR assets, also owns primary ISR assets to allocate on an instance-by-instance level.

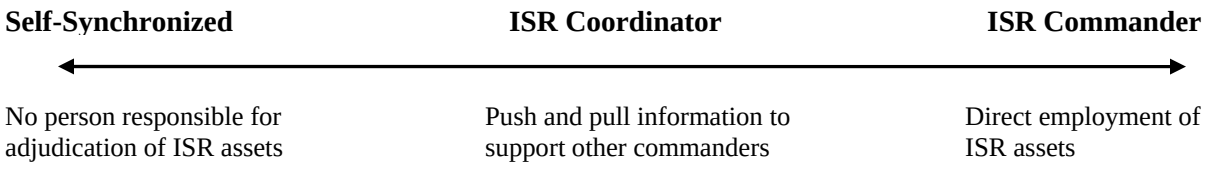

Figure 1. ISR Coordination Continuum.

The second independent variable — information sources — emulates network-centric warfare concepts, and has two levels: the Multi-Mission Manager (M^3) and shared folders. All players will have access to all the information, however the way that information is organized will vary: The organization of information emphasizes role-dependent information. When presenting the M^3 level of the variable, participants will access information via "M^3 Pages"— web pages which integrate information from multiple sources into a single product. Information within the M3 pages is organized around the participant's tasks. Information in the webspace is organized using the M^3 tool. When the M^3 is not present, information is available, but organized in a shared-folder schema. The information space provides tactical information needed primarily by the future planners; however (different) information in the webspace is also needed by the execution DMs.

Figure 2. Example M^3 Page.

Execution and Planning

Execution DMs are responsible for tactical execution while they engage in scenarios presented in the Distributed Dynamic Decisionmaking (DDD-III) simulation environment. Planning DMs are responsible for planning future mission(s), that is, they will be engaged in crisis action planning, which is used where limited time (24-72 hours) is available for planning. Planning will often entail the use of multiple ESG assets. Both triads require substantial ISR capability: executors require ISR resources to conduct the mission tasks and planners require significant ISR from both executors and from information-based assets. The execution triad engages in a scenario comprised of a series of discrete mission tasks with defined military objectives requiring a range

of time sensitive responsibilities, as well as some unanticipated tasks that place demands on ISR assets.

Tasks performed by the planners include prioritizing limited assets to most efficiently and effectively accomplish all tasks and missions. The planning process allows the deconfliction of tasks in a timely manner to minimize scheduling conflicts which could delay or cancel tasks/ missions. Development of a mission plan will require significant information from the information space, as well as ISR information from the execution DMs. Information requests can be made via the ISR Officer or directly with execution DM equivalents. Figure 2 depicts the relationships and major subordinate commands (MSC) that comprise the two triads of DMs. Each MSC (Sea Combat Command (SCC) and Marine Expeditionary Unit (MEU)) is comprised of one execution DM and one planning DM and one representative from the ESG.

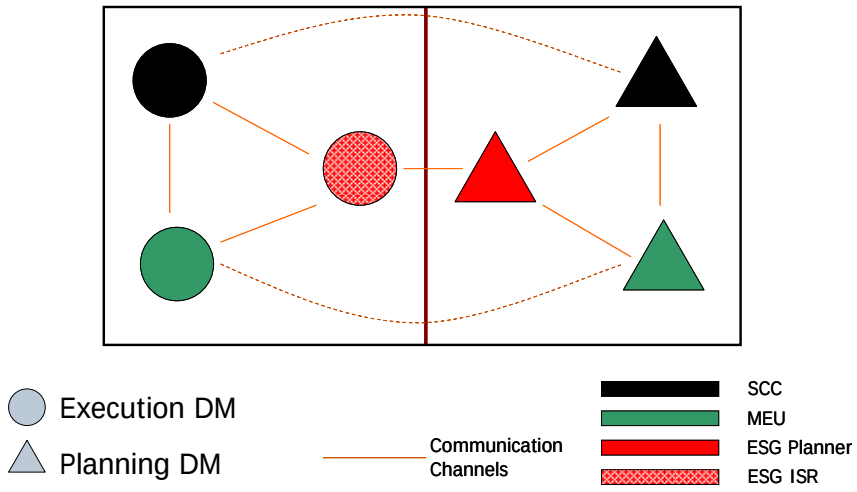

Figure 3. Participant Schematic Depicting Major Subordinate Commands for Execution and Planner Decisionmakers.

Roles and Responsibilities

Roles played by the six experimental participants include the following: (1) SCC execution role, (2) SCC planning – responsible for providing SCC input to future plan development, (3) MEU execution – includes elements of the air combat element (ACE), ground combat element (GCE), and land-based special-operations force (SOF), (4) MEU planner, (5) ISR Coordinator, and the (6) ESG planning DM – who is responsible for providing input on the future plan development, integration of injects from both the SCC and MEU planning DMs, and serving as the liaison between the executors and the planners. The scenario was developed to create tension over the use of ISR assets – often in limited supply – such as asset readiness, or the difficulty entailed in performing some tasks due to time pressure, and the expediency required for execution. Conflicts over the use of ISR assets force choices to be made regarding ISR asset use. This in turn encourages communication among participants and motivates the need for adjudication by the ISR officer.

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