# The Challenge of New and Emerging Information Operations[1]

**James E. Heath, Ph.D.**
Senior Intelligence and Technical Advisor
Land Information Warfare Activity (LIWA)
United States Army Intelligence & Security Command (INSCOM)
Fort Belvoir, Virginia, U.S.A.
e-mail: jim@heathmail.com

**Alexander E.R. Woodcock, Ph.D.** [2]
Chief Scientist and Vice President
Synectics Corporation, Fairfax, Virginia, U.S.A.
e-mail: woodcock@syncorp.com

## Introduction To Information Operations

Information operations as defined in the Joint Publication 3-13 of the Joint Staff (1998) are aimed at influencing the information and information systems of an adversary and defending one's own information and information systems. Such operations require the continuous and close integration of offensive and defensive activities, the design, integration, and interaction of command and control procedures with supporting intelligence, and may involve public and civil affairs-related actions (Figure 1).

Offensive information operations involve the use of supporting information and intelligence capabilities and assets to influence adversarial decision-makers and to achieve specific objectives and may be most effective during he initial stages of an emerging crisis. Defensive information operations are aimed at protecting and defending friendly information assets through such activities as information assurance, operations security (OPSEC), physical security, counterdeception, electronic warfare, and special information operations. Information operations should be supported by a function information operations cell that can be responsive to a wide range of planning and operational circumstances and should be involved in all joint military operations.  Planning for information operations must start at the earliest state of a joint force or ground campaign and can involve both deliberate and crisis response activities.

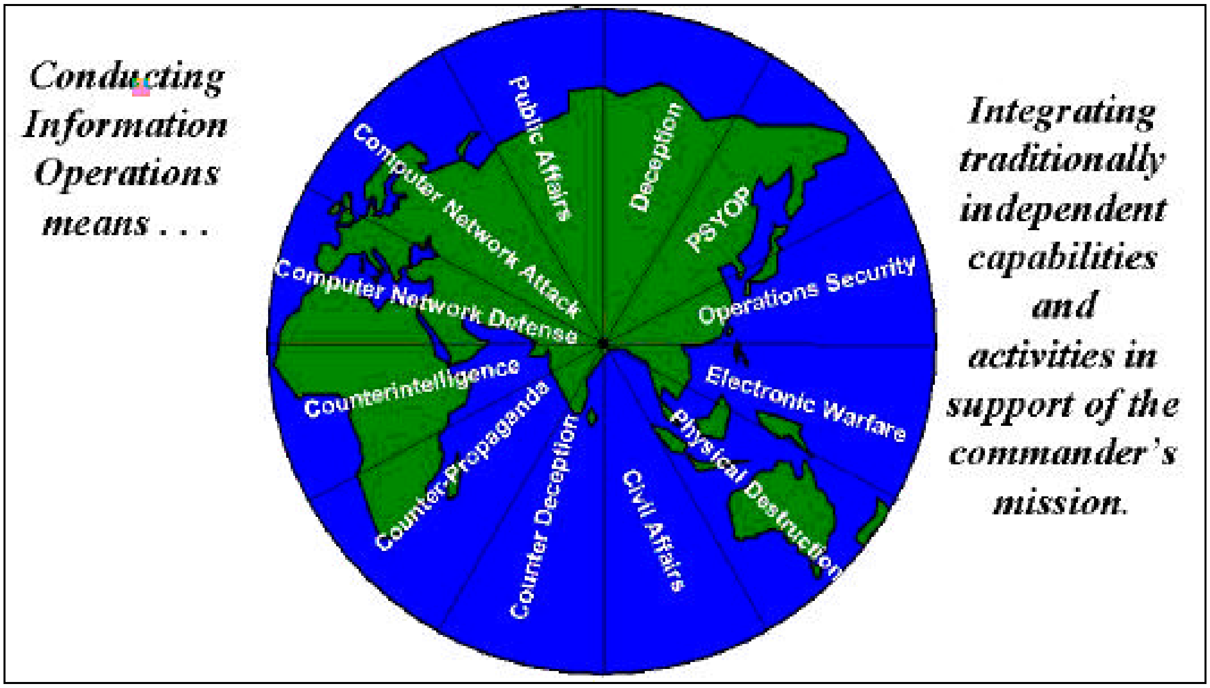


Figure 1: Information operations capabilities and related areas.

**The Challenge of New and Emerging Information Operations**

Joint Publication 3-13 serves as the foundation for addressing many of the new challenges within Information Operations. However, the key operational challenges are identifying Information Centers of Gravity, developing either non-kinetic or kinetic course of actions and defining the associated measurements of effectiveness.

Identifying an Information Center of Gravity is an extremely complex process. This process is also very subjective since IO is really about affecting how an opponent thinks, and plans in relation to one's perception about a particular set of issues. The complexity associated with defining Information Centers of Gravity results from trying to understand relationships between individuals and groups and their associated variables. These one-to-many or many-to-one relationships are dynamic in nature thus, further complicating an accurate temporal understanding of the situation. Because these dynamic variables involve such things as political, economic and social relationships, traditional military maps and symbology are often inadequate for accurately portraying the situation. In the following sections some new approaches and techniques for determining and displaying Information Centers of Gravity and their components will be discussed.

Once an adversary's Information Center of Gravity can be determined it must then be incorporated into the military commander's situational awareness picture to enable course-of-action planning. However, as discussed in the above this is very difficult when the situation does not involve a force-on-force problem. Similarly, how does one formulate a non-kinetic course-of-action and synchronize one's actions over very long time frames measured in months or years. Longer time frames associated with non-kinetic solutions are often required when associated with changing either an individual's or a group's perception. For an IO course-of-action to be effective one is really attempting to lengthen the opponent's capability to observe, orient, decide and act (OODA loop). In turn, this provides more time for the military commander to achieve a non-kinetic solution or to pick the time and place for a kinetic solution.

In order to develop IO courses-of-action new techniques, such as Q-Analysis, (ref our Q-Paper) are required. Q-analysis is a method based on algebraic topology developed initially by Atkin (1972, 1974, 1979) that has stimulated research by many investigators including Dockery (1982) and Griffiths (1983). The process of observation establishes relationships between the sets {P} and {A} where {A} is the set of the physically-possible phenomena permitted by the observational technique. Woodcock and Heath investigated this approach where {P} identified the three ethnic groups: Serb, Croat, and Muslim in Bosnia-Herzegovina. The set {A} was identified with specific poll data reflecting the public opinions of these groups on a series of topics related to their beliefs and feelings of security and related matters in Bosnia-Herzegovina. The Q-connectivity of entities was then described in terms of structures called simplexes. Entities that are linked by two relationships form a 1-simplex and those with three relationships form 2-simplexes, for example. In turn, the geometrical representation of these simplexes could illustrate pressure points for a particular Information Operation course-of-action. Because Q-analysis enables the view to be from the perspective of any group or issue, non-kinetic courses-of-action were able to addressed more easily.

Traditional centers of gravity are based on physical relationships while Information Centers of Gravity are based on complex, ill-defined relationships. Therefore, being able to quantify an IO battle damage assessment or measurement of effectiveness is quite different since it does not necessary involve a physical change. These measurements of effectiveness require techniques that enable one to understand how to create changes within the adversary's decision cycle or alter one's perception about particular sets of issues. In the following section, techniques for understanding perceptual changes will be discussed. These techniques provide some insight into the difficulty associated with the planning, syncronization, execution and defining measurements of effectiveness for IO courses of actions.

**The Land Information Warfare Activity (LIWA) and the Inscom Information Dominance Center**

The Land Information Warfare Activity (LIWA) is embracing a number of technologies to facilitate the transition from split-based operations to virtual operations in support of Information Operations. LIWA's central facility, the INSCOM Information Dominance Center (IDC), will simultaneously support many Field Support Teams (FST) distributed throughout the world communicating over whatever network topology is available (Figure 4 and Figure 5). LIWA will maintain a truly collaborative distributed environment (i.e. collaborative virtual environment) to facilitate rapid situational awareness and centralized support to these external teams.

New techniques for harvesting and organizing huge amounts of open source and classified data. Figure-2 represents one of the many visualization techniques used within the IDC. Harvested information is organized by themes or issues using a 2-D landscape metaphor. In essence this utilizes a perception or knowledge landscape as opposed to the traditional physical landscape view.

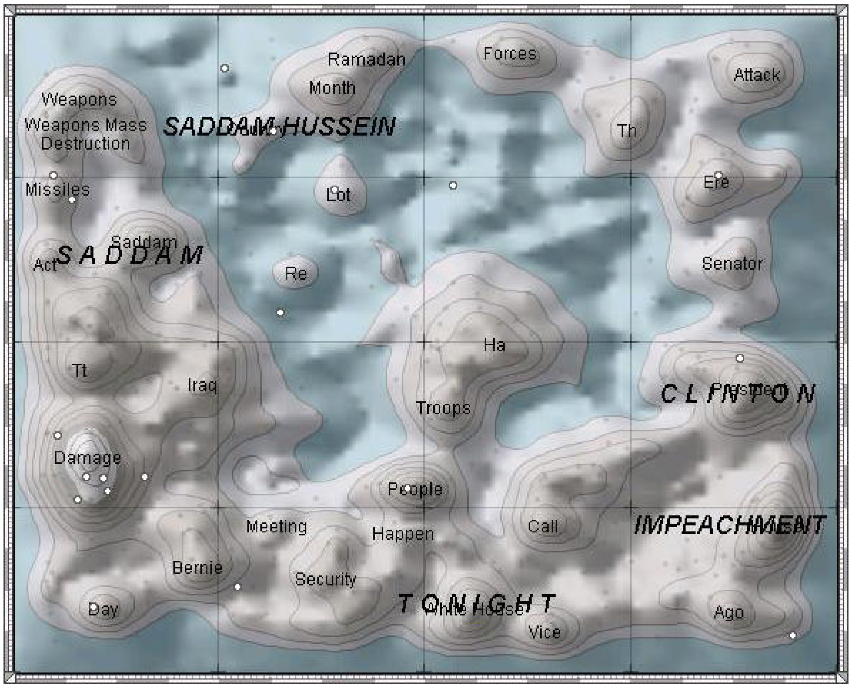


Figure 2: 2-D perception or knowledge landscape

Figure-3 extends the 2-D perception or knowledge landscape metaphor into a 3-D environment. The 3-D perspective enables temporal views of the key themes or issues to be rapidly understand. Therefore, change detection within an information environment enables a commander the capability to rapidly observe significant changes within enormous amounts of information. For the operational commander the concept of change detection will no longer refer to just physical changes.Therefore, the commanders collection managers will focus not only on the traditional physical sensors but also a “knowledge resolution sensor” for information spaces.

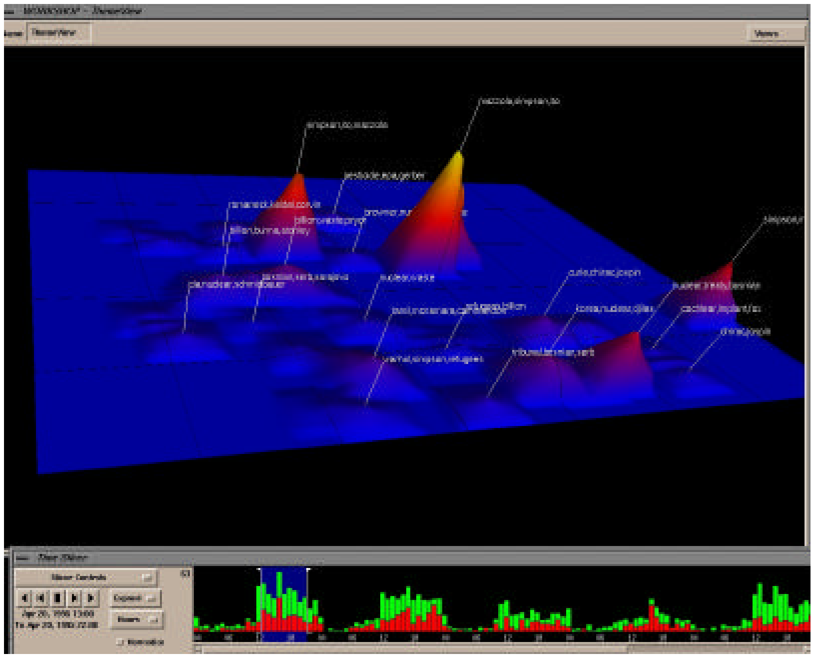

Figure 3: 3-D perception or knowledge landscape viewed temporally.

The Information Dominance Center employs Asynchronous Transfer Mode (ATM) to the Desktop for extremely high local performance, as well as with high speed interconnects to other important DoD and open information sources. Field Support Teams and other remote sites will typically have multiple network connections including satellite and land based access. The collaborative virtual environment under development at LIWA encompasses the following capabilities:

- *Video / Audio:* Within the IDC, audio and video collaboration will be supported using MPEG-2 (for high quality broadcast of conferences or upper level command) and MPEG-1 (for small group workstation collaboration) facilities.

- *Application Sharing and Shared Whiteboards:* Application Sharing involves infrastructure to facilitate multiple views of and control over a single application. Whiteboards, chat windows, etc., provide another way for users to share data. Most whiteboards allow drag and drop of images, and interactive graphic gesture creation.

- *Data Sharing:* In many ways, the IDC maps more closely to conventional corporate data infrastructures in its use of standards based centralized data infrastructures. Shared Relational and Object Oriented Databases will provide the core integration support for implementing the IDC's overall functionality.

- *Publish / Subscribe Event Distribution and Message Oriented Middleware:* Event services techniques involve the creation of channels for a number of event categories. Client applications register interest by subscribing to channels and are asynchronously notified whenever a Source application sends an event into the channel. Message Oriented Middleware (MOM) involves a centralized, reliable, message store provides the persistence necessary to implement this capability that can support loosely coupled applications, a capability that is critical to LIWA. MOM infrastructure will greatly simplify the implementation of the support applications for the Field Support Teams.

- *Distributed Model-View-Controller (MVC) Infrastructure:* The IDC is developing a distributed Model-View-Controller (MVC) architecture for facilitating the development of tightly coupled applications. MVC, which is perhaps the most common architectural model used for developing event-based, shared-data applications, can be distributed with the aid of such commercial communications infrastructure tools as CORBA, DCOM, or Java Remote Method Invocation (RMI).

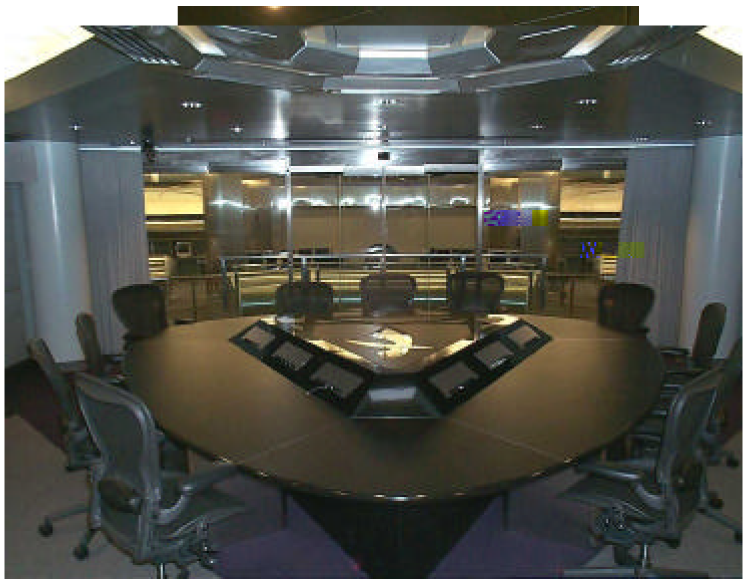

Figure 4: The Land Information Warfare Tactical Operations Center (TOC), the INSCOM Information Dominance Center. View from the conference room.

Figure 5: The Land Information Warfare Tactical Operations Center (TOC), the INSCOM Information Dominance Center. View from the large screen.

## CONCLUSION

Information Operations in support of civil-military interactions is becoming increasingly more important as non-kinetic courses-of-action are required. Incorporating IO into military operations up until now has been extremely difficult due to the lack of doctrine and operational or technological support. However, Joint Publication 3-13 of the Joint Staff has addressed the doctrinal requirements while innovative operational sites such as the Army's INSCOM Information Dominance Center are addressing the operational and technological needs. In fact, the IDC serves as a model for both the Department of Defense and a proposed virtual hearing room for Congress. As the IDC and its supporting technologies mature, individuals will be able to freely enter, navigate, plan, and execute operations within Perceptual and Knowledge Landscapes. This capability begins the transition from Information Dominance to Knowledge Dominance. The IDC is instantiating such entities as smart rooms, avatars, square pixel displays, polymorphic views, and other technologies for directly interacting in virtual domains. This will take us to the next paradigm of human-machine interaction within the multi-dimensional spaces required for Information Operations.

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2. Also: Guest Professor, The National Defence College, Stockholm, Sweden; Visiting Professor, Royal Military College of Science (RMCS) Shrivenham, England, U.K., and Corresponding Faculty Member, The Center for Computational Statistics and Probability, George Mason University, Fairfax, Virginia, U.S.A.