



Combat information center aboard USS Kitty Hawk.

U.S. Navy (Gallegher)

# Leading the Revolution in C<sup>4</sup>I

By JEREMY M. BOORDA

**T**he information revolution is a harbinger of notable changes in the objective and conduct of war. One important aspect of this revolution is information warfare—a potent command, control, communications, computer, and intelligence (C<sup>4</sup>I) capability with a profound influence on the way naval forces deter and if necessary fight wars. To discuss warfare in the information age, it is vital to appreciate how the Navy collects, disseminates, and uses information. Our approach is unique because it emphasizes forward presence. Simply put, one will not grasp our C<sup>4</sup>I vision unless the importance of naval forces being forward positioned is understood.

## Forward Presence

For two hundred years the Navy and Marine Corps have provided forces to leverage events overseas. The National Command Authorities and warfighting CINCs require naval forces that are forward, ready to respond to or deter crisis, and able to transition to war. Moreover, while all the services have a role in forward presence, I am convinced that naval forces are going to be relatively more significant as Army

and Air Force units continue to return to the United States.

The Navy and Marines will, correspondingly, play prominent roles in information warfare. Forward presence requires that the naval services aggressively approach information warfare as an engaged and enabling force. Unlike other services, the Navy must imbed information warfare in the fleet and be able to conduct information warfare from the time those forces leave CONUS to the end of an extended deployment.

## The Revolution in Military Affairs

We are in a revolution of no less importance than the advent of steam propulsion, carrier aviation, or nuclear submarines. The so-called revolution in military affairs has moved information and the need for information dominance to center stage in thinking about warfare. Development of advanced information and communications technologies will continue. Successful implementation of these innovations requires their integration into force structure and operational concepts.

Thus the way we organize and use technology is critical. The organizational aspects may actually be more important than the technical. The Navy will be a full partner in the revolution to leverage its investment in technology, attack vulnerabilities in enemy systems, and protect its own.

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In information warfare we are not really talking about something new. We must recognize that success on past battlefields has come from innovative ways of considering and combining new technologies, and not solely from the technological advances themselves. History is replete with examples of outnumbered forces which were victorious because they controlled vital information. Often both sides had similar technologies, but one gained an advantage by their innovative use.

For instance, the Navy applied information warfare to thwart the Japanese at Midway. So what is really new or revolutionary? It is the attempt to institutionalize—as others have done before—the use of information for tactical advantage. Using the Midway example, it was not information warfare that made the difference; it was information and pure luck—without the benefit of an overarching strategy.

Today we realize the value of systematically using information to influence operations and the fact that we have crossed the threshold into the information age. When the most critical enabler for naval expeditionary forces may be information, our tactics flow from information processing.

We can only gain the advantage over an enemy by being the first to effectively use offensive and defensive information

tactics as part of our warfighting arsenal; so the challenge is institutionalizing information warfare innovation and capitalizing on the opportunities available today.

## the challenge is institutionalizing information warfare innovation

### Enabling Force

The Navy and Marines have always provided combat credible forces, forward. Thus our information warfare weapons, command and control systems, and the associated expertise must be embedded in the force, ready to execute information warfare. Forward deployed naval forces need an in-place global C<sup>4</sup>I structure. For example, we have an embedded JFACC capability that gives us a structure for building joint C<sup>4</sup>I capability in theater. Moreover, because our posture forward allows the Navy to be in position as crises develop, information warfare will give us the ability to influence enemy decisions, prepare the battlespace before hostilities, and dictate the battle on our terms. Information based warfare, using advanced command and control with its associated high assurance connectivity, allows integration of battlefield information that in turn will increase effects from offensive firepower and maneuver of our dispersed units.

Information based warfare permits forces to fully exploit weapons technology to escalate the speed of battle. Denying an enemy's ability to communicate, going after command and control nets, and shutting down sensors will provide an upper hand on the battlefield. Also, information based warfare will afford the United States the operational flexibility to allocate forces and fires in real time and to defeat an enemy at the moment of our choosing. On the battlefield of the future, we will be unable to attain decisive victory without a comprehensive global command and control system. The foundation is a robust C<sup>4</sup>I architecture.

### Copernicus

Recognizing information as a weapon the Navy issued the Copernicus architecture in 1990. This is an initiative to make C<sup>4</sup>I systems responsive to the warfighter, field them quickly, capitalize on advances in technology, and shape doctrine to reflect changes. The Copernicus architecture is the structure of how C<sup>4</sup>I works. It represents satellites which pass data, computers which process information, and warfighters who need information to make tactical decisions. It should be noted that it is not a system but an architecture. In other words, one cannot go out and purchase or touch Copernicus.

This architecture represents a blueprint for capturing technological change. It is a bold C<sup>4</sup>I paradigm shift toward a unified design and procurement strategy specifically focused on the joint warfighter. Its designers recognized that stovepipe acquisition strategies do not work; engineers are too removed from users. Instead, the goal is to combine strategies and technologies to create a consistent situational awareness where information integration is seamless and warfighters are able to access information on demand.

From the outset Copernicus was not intended to be a formal acquisition program because there was no comprehensive DOD program. The intent was to serve as the definitive architecture and unifying strategy for multi-service joint C<sup>4</sup>I programs. The Navy tactical command system-afloat (NTCS-A) is a case in point. This dynamic system is part of the joint maritime command system (JMCS). It is installed on more than 200 ships, replaces a variety of less capable systems, and integrates information in one display.

### Jointness

The Armed Forces made a significant step toward a truly joint C<sup>4</sup>I structure in 1992 when the Joint Staff followed the Navy's lead and issued

“C<sup>4</sup>I for the Warrior.” This concept, based on Copernicus, envisioned a joint C<sup>4</sup>I architecture that provided timely sensor-to-shooter information direct to the warfighter. Then the Army published “Enterprise Strategy” in 1993 and the Air Force issued “Horizon” in 1994. Significant portions of those documents reflect the Copernicus effort. This architecture is more than a snapshot

**C<sup>4</sup>I systems must be built under a JCS unified strategy**

of the current C<sup>4</sup>I structure; it is a dynamic and evolving program which is flexible enough to adapt to rapid technological

change. This year the Navy will release an updated plan that will redefine Copernicus as it evolved, discuss acquisition strategies, and chart the course for the future. The emphasis for all of these initiatives will remain constant as Copernicus evolves to meet the goal of joint C<sup>4</sup>I for the warrior.

The Navy is the de facto C<sup>4</sup>I joint architect and its joint maritime command information system (JMCIS) is the backbone of the global command and control system (GCCS). The vast experience of the Navy and Marine Corps in digitizing the battlespace over the past thirty years is a model for building a comprehensive common tactical picture at sea and over land.

**Vision**

To realize this vision, C<sup>4</sup>I systems must be built under a JCS unified strategy. Copernicus provides this focus for the Navy and Marines. Our approach demands implementation of state-of-

Congress, identified Challenge Athena as one of the most innovative and successful imagery dissemination efforts. Demonstrations utilize open architecture and commercial standards to provide joint and allied interoperability.

By using the fleet as a C<sup>4</sup>I laboratory, operators gain valuable experience with equipment as system designers respond to customers. After a demonstration period, the advanced technology becomes a fielded operational system with trained operators to run it. The Copernicus architecture, while not in final form, is fielded and operational. It is a robust and dynamic system that provides global C<sup>4</sup>I in support of the national military strategy. It is part of the joint vision.

**Exercises and Doctrine**

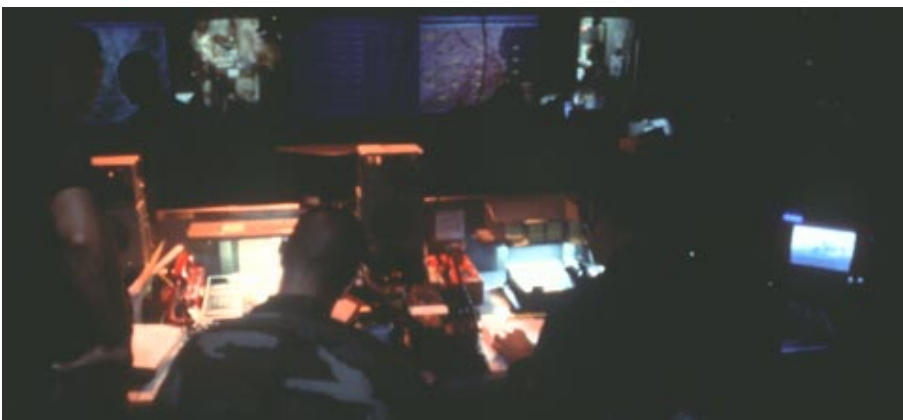
C<sup>4</sup>I assets are featured in a joint warfare interoperability demonstration, Kernel Blitz '95, which spans two oceans and a continent. It integrates an amphibious ready group; a geo-transformed mine countermeasures force; a simulated carrier battle group; Air Force B-52s, B-1s, and F-117s, and AWACS aircraft; and Army medevac units, with modeling and simulation to offer realistic joint training in a synthetic theater of war in a European environment.

Navy C<sup>4</sup>I, within the context of information warfare, cannot succeed without the doctrine to support it. To achieve this, space and electronic warfare specialists work closely with the Naval Doctrine Command to provide an operating framework and guidance for forward deployed forces. Information warfare is treated in Naval Doctrine Publication (NDP) 3, *Naval Operations*, and C<sup>4</sup>I in NDP 6, *Command and Control*. This comprehensive analytical approach to information warfare which combines strategy, tactics, and doctrine fully prepares the Navy/Marine Corps team for the 21<sup>st</sup> century. It makes the Navy the logical choice to lead the development of joint architecture for information and C<sup>4</sup>I systems.

**Challenges**

Implementing information warfare will be a major requirement in the near future. There are two specific problems to be tackled. First, the cost of developing software is rising exponentially even as the cost of hardware remains fairly constant. Secondly, technology is moving faster than it can be integrated into the fleet. As a result technology may become obsolete by the time a system is fielded. It is time for the Navy to basically change its information system acquisition approach. One way is modeling and simulation to test product development and to speed up the time required to field a new system.

Finally, for the Navy to maintain the lead on the information superhighway, it must have a



U.S. Navy (Gallagher)

**Combat information center aboard USS Kitty Hawk.**

the-art technology with highly trained operators. This is achieved by fielding advanced technology demonstrations like Challenge Athena hardware—which offers high volume data communications afloat—to meet fleet CINC requirements. In fact, the Deputy Assistant Secretary of Defense for Intelligence and Security, in testimony to



*USS Carl Vinson  
in Arabian Gulf.*



U.S. Navy (Michaels)

**for the Navy to maintain the  
lead it must have a strong  
foothold in space**

strong foothold in space, to the extent that space is a medium for exploitation by the warfighter, not a mission or the fourth dimension of the battlefield. Space offers access to real time coverage

and connectivity. The Navy has integrated space systems in every facet of its operations to improve communications, navigation, surveillance, and environmental support. We have made im-

pressive gains in space despite the fact that the Navy receives only 4 percent of the budget and 2 percent of the personnel allocated to military space operations.

This has been done through innovation, agility, and competition for ideas. The Navy has succeeded in space through initiatives such as the ultrahigh-frequency follow-on satellite program, a model for streamlining acquisition strategies through fixed-priced multi-year contracts, and taking advantage of commercially competitive launch capabilities. With the widely dispersed, mobile, and dynamic nature of naval warfare,

space system support is integral to strategy, doctrine, and tactics.

We have crossed a threshold and must adapt to fight and win wars in the information age. It is time to be proactive and to keep naval forces ahead of the information bow wave. Toward that end, I established the Naval Information Warfare Activity, Fleet Information Warfare Center, and Modeling and Simulation Office. Moreover, the Navy issued a military satellite communications strategy and defense information infrastructure master plan. Also, I organized a tiger team under the Chief of Naval Education and Training to get information warfare incorporated into every level of fleet and individual training. It is clear that information has become a major factor in warfare and will grow in importance. Join us in redefining how wars are fought and won.

**JFQ**

*This article is adapted from an address presented to the Armed Forces Communications and Electronics Association in Washington, D.C., on March 23, 1995.*