

# CRS Report for Congress

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## Navy Network-Centric Warfare Concept: Key Programs and Issues for Congress

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### Summary

Network-centric warfare (NCW) is the Navy's central concept for organizing its efforts to transform itself for military operations in the 21<sup>st</sup> Century. NCW focuses on using information technology to link together Navy ships, aircraft, and shore installations into highly integrated networks. It could significantly improve U.S. naval capabilities and lead to substantial changes in naval tactics, doctrine, and organization. Key programs for implementing NCW include the Cooperative Engagement Capability (CEC), the Naval Fires Network (NFN), the IT-21 program. A related program is the Navy-Marine Corps Intranet (NMCI). Congress has closely followed and expressed concern for some of these programs, particularly NMCI. This report may be updated if developments warrant.

### Network-Centric Warfare

The concept of network-centric warfare (NCW) emerged in 1997 and has become the Navy's central concept for organizing its efforts to change and transform itself for 21<sup>st</sup> Century military operations. NCW focuses on using advanced information technology (IT) – computers, high-speed data links, and networking software – to link together Navy ships, aircraft, and shore installations into highly integrated local and wide-area networks. Within these networks, Navy and Marine Corps ships, aircraft, and forces ashore will share large amounts of critical information on a rapid and continuous basis. The Department of the Navy (DoN) believes that NCW will dramatically improve naval combat capability and efficiency by helping the fleet to achieve what DoN officials have called "speed of command" (an ability to generate and execute commands at much higher speeds), which will permit U.S. naval forces to outpace adversary decisionmaking and thereby lock out (i.e., foreclose) potential adversary strategies.<sup>1</sup>

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<sup>1</sup> For discussions of NCW, see Alberts, David S., *et al.* *Network Centric Warfare, Developing and Leveraging Information Superiority*. Washington, Department of Defense, 1999. 256 p.; Cipriano, Joseph R. *A Fundamental Shift in the Business of Warfighting*. *Sea Power*, March (continued...)

## Key NCW Programs

The Navy's effort to implement NCW involves several IT procurement efforts. Key among these are the Cooperative Engagement Capability (CEC) program, the Naval Fires Network (NFN), and the IT-21 investment strategy. A related program is the Navy-Marine Corps Intranet (NMCI). Each of these is discussed below.

In addition to these programs, the Navy in March 2002 announced that it was establishing a new Naval Network Warfare Command (NETWARCOM), headed by an admiral, to be the central operational authority responsible for coordinating all IT, information operations, and space requirements and operations within the Navy. The command is scheduled to begin operating in June 2002.

**CEC.** The Cooperative Engagement Capability (CEC) system uses antennas and data processors to link U.S. Navy ships and aircraft operating in a particular area into a single, integrated air-defense network in which radar data collected by each platform is transmitted on a real-time (i.e., instantaneous) basis to the other units in the network. Each unit in the CEC network fuses its own radar data with data received from the other units. As a result, units in the network share a common, composite, real-time air-defense picture. CEC will permit a ship to shoot air-defense missiles at incoming anti-ship missiles that the ship itself cannot see, using radar targeting data gathered by other ships and aircraft. It will also permit air-defense missiles fired by one ship to be guided by other ships or aircraft. The Navy wants to install the system on its aircraft carriers, Aegis-equipped cruisers and destroyers, selected amphibious ships, and E-2C Hawkeye carrier-based airborne early warning aircraft over the next several years.<sup>2</sup> The system has potential for being extended to include Army and Air Force systems.<sup>3</sup>

Tests of CEC aboard Navy ships in 1998 revealed significant interoperability (i.e., compatibility) problems between the CEC system's software and the software of the air-defense systems on some ships, particularly surface combatants equipped with the Baseline 6 version (then the most recent version) of the Navy's Aegis air defense system. In response, the Navy undertook a major two-year effort to identify, understand, and fix the problems. The CEC system, with the new fixes, passed its technical evaluation (TECHEVAL) testing in February and March 2001 and final operational evaluation (OPEVAL) testing in April and May 2001. In April 2002, DoD acquisition chief E.C. "Pete" Aldridge, Jr. approved the program to enter "Milestone III" in the acquisition process, and approved production of CEC systems for FY2002 and FY2003 at a rate of

<sup>1</sup> (...continued)

1999: 39-42; Bender, Bryan. Buying Into Networked Warfare. *Jane's Defence Weekly*, May 13, 1998; West, Leslie. Network-Centric Warfare Realizes Its Promise. *Sea Power*, March 1998: 38-40; and Cebrowski, Arthur K., and John J. Garstka. Network-Centric Warfare: Its Origins and Future. *U.S. Naval Institute Proceedings*, January 1998: 28-35.

<sup>2</sup> For descriptions of CEC, see Balisle, Phil. CEC Provides Theater Air Dominance. *U.S. Naval Institute Proceedings*, May 2002: 60-62; Busch, Daniel, and Conrad J. Grant. Changing The Face of War. *Sea Power*, March 2000, 37-39; O'Driscoll, M. [Michael] J., and J. [Jerry] A. Krill. Cooperative Engagement Capability. *Naval Engineers Journal*, March 1997: 43-57.

<sup>3</sup> Ratnam, Gopal. Navy Looks to Persuade Other Services To Use New CEC. *Navy Times*, August 5, 2002: 26-27.

5 units per year. A further “Milestone B” review of the program was scheduled for April 2003.<sup>4</sup>

Navy officials have acknowledged that the CEC system (and NCW in general) will place strains on the limited data-transmission bandwidth capability currently available to the Navy. One contractor has proposed modifying CEC with a capability called the Tactical Component Network (TCN). Advocates of TCN argue that incorporating it into CEC will reduce the bandwidth required by CEC without reducing CEC effectiveness. Advocates of the existing CEC approach argue that it has been modified to address this issue.<sup>5</sup>

**NFN.** The Naval Fires Network uses commercial off-the-shelf (COTS) IT technology to link naval forces operating in an area into a single real-time targeting network for coordinating gun and missile fire to attack surface and land targets, particularly time-critical targets, in support of friendly forces ashore. The Navy has been experimenting with NFN in numerous exercises and is working to accelerate the introduction of the system into the fleet. In March 2002, the Navy announced that the aircraft carrier Abraham Lincoln would be the first warship to conduct operations with a full NFN capability.<sup>6</sup>

**IT-21.** IT-21, which stands for IT for the 21<sup>st</sup> Century, is the Navy’s investment strategy for procuring the desktop computers, data links, and networking software needed to establish an intranet for transmitting tactical and administrative data within and between Navy ships. The IT-21 network uses COTS desktop computers and networking software and will provide a multimedia (text, data, graphics, images, voice, and video) organizational intranet similar to the Capitol Hill intranet or corporate intranets. The IT-21 concept originated in the Pacific Fleet in 1995-1996. The Navy plans to link most of the fleet into the IT-21 intranet within the next few years. The Navy believes IT-21 will significantly improve U.S. naval warfighting capability and achieve substantial cost reductions by significantly reducing the time and number of people required to carry out various tactical and administrative functions.<sup>7</sup>

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<sup>4</sup> Woods, Randy. CEC Enters Milestone III; Milestone B Review Expected In April. *Inside the Navy*, April 8, 2002.

<sup>5</sup> Woods, Randy. England Says TCN Could Play Role In Navy’s Network-Centric Future. *Inside the Navy*, August 12, 2002; Mullen, Richard. Battle Lines Form Over Navy Sensor Technology. *Defense Week*, July 29, 2002; Woods, Randy. Navy Gears Up For Next Phase of Cooperative Engagement Capability. *Inside the Navy*, July 29, 2002; Hodge, Nathan. Navy to Test TCN On Aegis Ships, Airborne Radar. *Defense Week*, July 15, 2002; Hodge, Nathan. TCN Undergoes Key Test During Cobra Gold. *Defense Week*, May 28, 2002; Hodge, Nathan. Navy Needs CEC ASAP: Admiral. *Defense Week*, May 28, 2002: 8; Pierce Terry C. Sunk Costs Sink Innovation. *U.S. Naval Institute Proceedings*, May 2002: 32-35.

<sup>6</sup> Hodge, Nathan. Navy Takes New Network-Centric Tool To Sea. *Defense Week*, August 12, 2002; Nagle, David. Naval Fires Network: The Transformation of Naval Warfare. *Navy News Service*, May 17, 2002; Woods, Randy. Abraham Lincoln Carrier Will Deploy With Full Naval Fires Suite. *Inside the Navy*, March 18, 2002.

<sup>7</sup> For more on IT-21 and the Navy-Marine Corps Intranet (NMCI), see Clemins, Archie. Standby for Big Reform – A Navy-Marine Corps Intranet. *Navy Times*, March 6, 2000: 58; Kreisher, (continued...)

**NMCI.** The Navy-Marine Corps Intranet (NMCI) is a corporate-style intranet that will link together Navy and Marine Corps shore installations in much the same way that the IT-21 effort will link together Navy ships. When completed in 2003, the NMCI will include a total of about 411,000 computer work stations, or “seats,” at scores of Navy and Marine Corps installations in the continental United States, Hawaii, Guam, Puerto Rico, Guantanamo Bay (Cuba), and Iceland. In October 2000, the Navy awarded an industry team led by Electronic Data Systems (EDS) Corporation a \$6.9 billion contract for installing, supporting, and periodically upgrading the NMCI over the next 8 years. A total of 160,000 seats have been authorized, and 20,000 have been brought online. A 30-day test of these 20,000 seats began in early August 2002; if these tests are successful, the Navy plans to order another 150,000 seats.<sup>8</sup> Navy officials reportedly have decided to link the IT-21 and NMCI networks together under a common information architecture called Forcenet.<sup>9</sup>

The 106<sup>th</sup> Congress expressed concern over the difficulty of identifying the total cost of the NMCI effort in Navy budget documents, the Navy’s ability to finance NMCI effort without disrupting other important Navy programs, the pace at which the Navy planned to implement NMCI, the Navy’s ability to properly structure and manage the huge NMCI contract (the largest networking-services IT contract undertaken by a federal agency), the potential impact of NMCI implementation on employees of current naval networking and telecommunications systems, and whether the network should be extended to cover installations in the Marine Corps, which already has its own service-wide network.

In response, the Navy took actions to improve the visibility of NMCI costs in its budget, stated that the NMCI would be financed to a large degree using funds programmed for older IT procurement programs that the NMCI will supercede, stated that implementing NMCI would have only a small net employment impact, and argued that implementing NMCI in the Marine Corps as well as the Navy would result in greater efficiencies and lower overall costs for the two services. At Congress’ direction, the plan for implementing NMCI was restructured to begin with a smaller number of initial installations, so that the success of the NMCI effort could be more carefully assessed before the program is expanded to cover larger parts of the Navy and the Marine Corps.

Responding to a direction in the FY2002 defense authorization bill for the Secretary of the Navy to name a single person to oversee the NMCI program as his or her sole responsibility, the Navy in February 2002 announced that it had created a single program office to manage the NMCI program, headed by an admiral. An NMCI senior executive

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<sup>7</sup> (...continued)

Otto. Breaking Down the Barriers. *Sea Power*, March 2000: 34-36; Clemins, Archie. It’s More Than E-Mail. *U.S. Naval Institute Proceedings*, February 2000: 56-58; Dawson, Cutler J., et al. The IT-21 Advantage. *U.S. Naval Institute Proceedings*, December 1999: 28-32.

<sup>8</sup> Ma, Jason. For NMCI, 20,000 Seats Now Online, Next Phase of Tests Starting. *Inside the Navy*, August 19, 2002.

<sup>9</sup> Jonson, Nick. Navy Plan To Integrate Land And Sea Networks Will Be Evident Soon, Official Says. *Aerospace Daily*, March 28, 2002.

council headed by the Navy's acquisition executive will provide senior-level review of the program office.<sup>10</sup>

## Issues for Congress

Potential issues for the 107<sup>th</sup> Congress pertaining to NCW include the following:

**Tracking implementation of NMCI.** Potential NMCI issues concern the success of the initial NMCI installation efforts, potential ways to improve the installation process for subsequent installation phases, and potential steps for reducing program costs.<sup>11</sup> The conference report (H.Rept. 107-333 of December 12, 2001) on the FY2002 defense authorization act (S. 1438/P.L. 107-107) contains a provision (Section 362) permitting the Navy to proceed with the NMCI project after meeting certain testing requirements. The provision also required the Navy to submit to Congress a report on the scope and status of NMCI testing and the implementation of the NMCI network, and to identify a single individual whose sole responsibility will be to direct and oversee the NMCI program. The provision also required GAO to study the impact of NMCI implementation on the rate structure of naval shipyards and other repair depots. The conferees expressed concern about delays in implementing the program and the resulting shortage of data about the viability and performance of NMCI. (See pages 55-57 and 641-642 of the conference report.)

**Resolving implementation issues with CEC.** Issues include whether the interoperability problems have been fully resolved, whether the Navy's restructured installation schedule is appropriate, and what, if anything, CEC implementation problems reveal about the challenges of incorporating advanced IT into complex weapon systems.

**Adequacy of transmission bandwidth for CEC.** Another issue is whether TCN should be incorporated into CEC as part of the effort to manage limits on available bandwidth, and what implications TCN would have for the evolution of, and acquisition strategy for, the CEC system.

**Questions concerning NCW in general.** Congress may consider other potential issues relating to NCW in general, including the following:<sup>12</sup>

- ! *Tactics, doctrine and organization:* The Navy recognizes that it needs to develop new tactics, doctrine, and organizations to take full advantage

<sup>10</sup> Bohmfalk, Christian. Navy Creates NMCI Program Office, Responding to Congress' Demand. *Inside the Navy*, February 11, 2002; Keeter, Hunter. NMCI TO Get Own Program Office, Consolidated Management. *Defense Daily*, February 6, 2002: 10.

<sup>11</sup> For discussions, see Woods, Randy. Navy, EDS Say They Are Working To Improve NMCI Rollout Procedures. *Inside the Navy*, May 20, 2002; Keeter, Hunter. Navy, EDS Say Current Processes Inadequate For Higher-Volume NMCI Roll-out. *Defense Daily*, May 16, 2002; Tiboni, Frank. U.S. Navy Targets NMCI Software Cuts. *DefenseNews*, May 6-12, 2002: 36.

<sup>12</sup> For a survey of potential issues relating to NCW, see Jenik, Douglas A. Beyond the Rose-Colored Glasses. *U.S. Naval Institute Proceedings*, February 2000: 60-63; Barnett, Thomas P. M. The Seven Deadly Sins of Network-Centric Warfare. *U.S. Naval Institute Proceedings*, January 1999: 36-39.

of NCW; this could significantly alter current practices, if not the leadership culture itself, and pose challenges for retraining Navy personnel.

- ! *Overall fleet design:* The Navy is currently adding NCW to an overall fleet architecture that has evolved in a gradual fashion over the last several decades. The issue is whether the Navy has taken the relatively new concept of NCW adequately into account in its thinking and planning for future ship and aircraft designs and the future overall architecture of the fleet.
- ! *Allied interoperability:* If NATO and other allied navies invest in NCW-enabling technologies, U.S.-allied naval interoperability (the ability to operate together effectively in multinational efforts) could be significantly increased; if they do not, maintaining naval interoperability could become increasingly difficult.
- ! *Information security:* The Navy acknowledges that it needs to work on measures for preventing, detecting, and responding to attempts by outsiders to illegally enter the computer networks being created to implement NCW.

## Legislative Activity

**Authorization.** In its markup of the FY2003 defense authorization bill (H.R. 4546), the **House Armed Services Committee** included a provision (Section 351) that extends the duration of the NMCI contract from the current 5 years to 7 years, notwithstanding the law (10 U.S.C. 2306(c) that normally limits multiyear contracts to a term of 5 years. The committee discussed this action on page 298 of its report (H.Rept. 107-436 of May 3, 2002) on the bill.

In its markup of the FY2003 defense authorization bill (S. 2514), the **Senate Armed Services Committee** included a provision (Section 342) that would authorize DoD to modify the start date of the NMCI contract for the purposes 10 U.S.C. 2306(c). The committee discussed this action on pages 291-292 of its report (S. Rept. 107-151 of May 15, 2002) on the bill. The committee also recommended reducing the Administration's \$20-million FY2003 research and development (R&D) funding request for starting a new Forcenet program to \$12 million. (page 184)

**Appropriation.** In its report (H.Rept. 107-532 of June 25, 2002) on the FY2003 defense appropriation bill (H.R. 5010), the **House Appropriations Committee** commented extensively on the NMCI program, expressing concerns over the incorporation of "legacy" computer programs into the network and the adequacy of the testing program for the network. (pages 198-199) The committee included a provision (Section 8118) that prohibits the Navy from ordering additional seats beyond the 160,000 already authorized until at least 20,000 seats transition fully to the network and the system undergoes adequate operational test and evaluation. The committee also added a total of \$12 million to the NFN program (pages 208 and 264.)

In its report (S.Rept. 107-213 of July 18, 2002) on H.R. 5010, the **Senate Appropriations Committee** recommended rejecting the Navy's \$20-million R&D request for funding for a new Forcenet program. (page 191)