

## **FORCE XXI BATTLE COMMAND, BRIGADE AND BELOW (FBCB2)**



Two important components of the Army's Battle Command System and the Battlefield Digitization effort are the Force XXI Battle Command, Brigade and Below (FBCB2) program and its supporting Tactical Internet. FBCB2 is a digital, battle command information system intended to provide commanders, leaders, and soldiers—from brigade to individual soldier, and across all the Battlefield Functional Areas—improved command and control and enhanced situational awareness information. FBCB2 primarily consists of software, but will also include a ruggedized computer for those users and platforms without an existing computer system. Systems with existing computers capable of hosting FBCB2 software will receive the Embedded Battle Command software—a sub-set of FBCB2—and additional hardware as necessary. Embedded systems for the near term include the M2A3 Bradley Fighting Vehicle, the M1A2 System Enhancement Program Tank, and the Army Tactical Command and Control Systems (ATCCS).

FBCB2's primary functions are to send and receive automatic position location reports derived from its interface with the Global Positioning System and to send and receive command and control message traffic via digital over-the-air radio transmissions. The Tactical Internet is the network of radios and routers that provide linkages to connect the myriad FBCB2 platforms (both vertically and horizontally) across the combined arms force. The Tactical Internet consists of the Enhanced Position Location Reporting System, the Single-Channel Ground and Airborne Radio System, and the Internet Controller router.

FBCB2 and the Tactical Internet perform as a network within brigade-sized and smaller units. At the brigade and battalion Tactical Operations Centers (TOCs), the Tactical Internet interfaces with ATCCS, an Ethernet-based local area network of computers representing the functional areas of intelligence, maneuver, air defense, combat service support, and fire support. This interface permits information collected and disseminated via ATCCS systems to be rapidly passed through the Tactical Internet to FBCB2 computers. Likewise, the position reports of individual and unit locations are passed upwards through the FBCB2 and Tactical Internet into the ATCCS system for dissemination throughout the force. Network initialization and management requirements are performed by the Tactical Internet Management System that resides at the brigade TOC.

### **BACKGROUND INFORMATION**

The Army initiated the Force XXI Battlefield Digitization program in 1994, with the intent to proliferate and integrate digital communications and information management technologies across the

combined arms spectrum. The Army's efforts have been demonstrated in a series of Advanced Warfighting Experiments (AWEs). The Task Force XXI AWE equipped a brigade from the 4th Infantry Division with FBCB2 (Appliqué) hardware and software on all of its 1,600-plus vehicles. Due to immaturity of the FBCB2 and Tactical Internet, the degree of digital connectivity achieved during the Task Force XXI AWE was not sufficient to achieve expected increases in lethality, survivability, and op tempo and was not suitable for tactical operations.

A Limited User Test (LUT)-1 was conducted at Ft. Hood in FY98 with a Battalion Task Force of 232 platforms equipped with FBCB2. The FBCB2 software lacked several critical capabilities called for in the ORD and experienced many heat-related failures. Nonetheless, FBCB2 system performance during LUT-1 represented a significant improvement over that observed during the Task Force XXI AWE. The friendly situational awareness information provided by FBCB2 and the new Tactical Internet architecture was generally accurate and timely, and the improved system stability permitted soldiers to employ FBCB2 information during the execution of their missions. A Reliability Demonstration Test (RDT) was conducted from June-July 1999 to demonstrate correction of heat-related hardware failures experienced during LUT-1. A large increase in the hardware reliability was observed, but a comparable demonstration during an OT is required to determine that the improved performance can be reproduced in the operational environment. It should also be noted that the RDT results did not factor in failures of non-FBCB2 equipment critical for FBCB2 to be effective.

In June 1999, the Army proposed a restructured FBCB2 Program with heavy emphasis on system-of-system digitization, and also on the role of the Army Battle Command System (ABCS). Under the revised architecture, FBCB2 hardware will not be present in Tactical Operations Centers. Situation awareness information will be processed by Embedded Battle Command software, and command and control functions (messages, orders, overlays, etc.) will be performed by ABCS software, both hosted on ATCCS workstations. Therefore, any testing that includes units above the company level must include ATCCS systems and requisite interoperability between FBCB2 and ABCS software. This requires FBCB2 spiral development to coincide with the spiral developments of other Battlefield Digitization programs, as determined by the requirements of the next capability package.

A combined LUT-2/Force Development Test and Experiment was scheduled for FY00 to examine performance and interoperability of FBCB2 and ABCS systems, as well as critical tactics, techniques, and procedures. As a result of immature ABCS software, the Army downgraded the LUT-2 to a Customer Test (CT) when it became clear that the LUT-2 entrance criteria could not be achieved. Although not technically an operational test, the CT was essentially the same test as LUT-2. ABCS functionality proved ineffective at developing and disseminating operational orders and overlays during CT, hindering the attainment of the Common Tactical Picture and prosecution of the maneuver battle.

## **TEST & EVALUATION ACTIVITY**

The Army conducted Field Test-3 in January 2001 at the Electronic Proving Ground, and this test was followed by a brigade-level LUT-2 in April 2001 at the National Training Center, in conjunction with the Army's Division Capstone Exercise. Although new functionality was demonstrated, network performance measures for FBCB2 messages were significantly reduced from prior tests, and the interoperability between FBCB2 and ABCS was ineffective. Based on these results, the Army decided to pursue a revised acquisition strategy where the links between FBCB2 and ABCS are severed for the threshold requirement. The FBCB2 ORD has been revised with new blocks, and is to be reviewed by the Joint Requirements Oversight Committee in late 1QFY02. Changes to the TEMP and Test Plans are also underway.

In September 2001, production-representative FBCB2 hardware and software were examined in Field Test-4 to determine their readiness for the FBCB2 IOT&E scheduled for December 2001. The IOTE entrance criteria were not met, and this event was downgraded to a LUT.

## **TEST AND EVALUATION ASSESSMENT**

Survey data from operational tests suggests that the employment of FBCB2 assists commanders in the control of maneuver and in the synchronization of combat power. Other observations indicate that situation awareness provided by FBCB2 permits commanders to focus more of their time on actually commanding, as less time is required to track positions and movement of their forces. These results highlight the potential of FBCB2; however, these anecdotes reflect the satisfaction of soldiers in FBCB2 when it works, and belie the inconsistent performance that has been observed to date. A number of critical enhancements are needed in order to achieve a reliable and operationally effective and suitable capability.

Specific concerns, or required enhancements, include the following:

- A network management capability that can perform required unit task reorganizations, monitor the network's health, and respond to identified problems has yet to be demonstrated.
- Interoperability with ABCS software is required in order to provide brigade-and-below capability. FBCB2-ABCS interoperability has not achieved the maturity required to perform basic command and control tasks.
- Network stability and system reliability are much lower than would be operationally suitable, and extensive contractor support has been required to achieve even these performance levels. System support plans have yet to be finalized, but drafts are at odds with Army policy that limits the number of contractors on the battlefield.
- Many operations/tasks require cumbersome workarounds that are time-consuming and invite mistakes. The soldier operators have often responded to this situation by not employing required capabilities, with resulting mission degradation.
- There have been high levels of fratricide in all digital events to date.
- Scalability, or the ability of the network communications to perform well with a large but operationally realistic number of nodes, remains a concern. Many unexpected problems surfaced during April 2001 LUT-2 testing with two brigades, and the proposed fixes have yet to be demonstrated in a large network.
- Operational testing conducted to date has been restricted to near-ideal conditions of EW/IW, weather, visibility, and terrain. Significant degradation in performance is expected as any of these conditions become more stressful. Furthermore, tactics, techniques, and procedures to support graceful degradation are immature. The Army proposes to defer OT in these environments until after Milestone III. Adequate testing in the above environments is required in order to determine how much degradation the systems can tolerate before becoming ineffective and the ability of soldier operators to recognize problems and execute the proper response.

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