
Director, Operational Test and Evaluation

Joint Battle Command – Platform (JBC-P)

Multi-Service Operational Test and Evaluation Report



January 2015

This report on the Joint Battle Command – Platform (JBC-P) fulfills the provisions of Title 10, United States Code, Section 2399. It assesses the adequacy of testing and the operational effectiveness, operational suitability, and survivability of the JBC-P.


J. Michael Gilmore
Director



**Joint Battle Command – Platform (JBC-P)
Joint Version 5 (JV5) Block 2 Display and Keyboard (left) and Commander using JBC-P (right)**

Executive Summary

This report assesses the test adequacy, operational effectiveness, operational suitability, and survivability of the Joint Battle Command-Platform (JBC-P). The Multi-Service Operational Test and Evaluation (MOT&E) results are intended to provide input to an Army materiel release decision and a Marine Corps fielding decision for JBC-P Software Build 6.0. During the test, DOT&E assessed new capabilities and verification of correction of deficiencies from the JBC-P Software Build 5.0 Initial Operational Test and Evaluation, which was conducted during the Army's Network Integration Evaluation (NIE) 13.2 in May 2013.

The Army Test and Evaluation Command conducted the JBC-P MOT&E, from April 23 through May 17, 2014, at Fort Bliss, Texas, and White Sands Missile Range (WSMR), New Mexico. The JBC-P MOT&E was conducted as part of the Army's NIE 14.2, and included a Pilot Test (April 28 through May 2) and a Record Test (May 6 –17). The test location was a dispersed desert environment with limited urban terrain. The Army and Marine Corps' testing of JBC-P was adequate and was conducted in accordance with a DOT&E-approved test plan. The Army also included JBC-P Software Build 6.0, modified with fixes, as a baseline system in NIE 15.1, October 15 to November 2, 2014, and collected Soldier surveys and observations on the system's performance.

The JBC-P MOT&E test units consisted of the Army's 2nd Brigade, 1st Armored Division (2/1 AD), configured as a heavy brigade combat team with brigade headquarters and six battalions, and the Marine Corps' 2-8th Infantry Battalion (under operational control of the 2/1 AD). The brigade was equipped with JBC-P and predecessor systems including Force XXI Battle Command, Brigade and Below Joint Capabilities Release (FBCB2 JCR), and FBCB2 Version 6.5. The units conducted operationally realistic scenarios to include offensive, defensive, and stability missions with JBC-P employed at-the-halt and on-the-move.

Operational Effectiveness

The Joint Battle Command – Platform (JBC-P) Software Build 6.0 is not operationally effective. It did not demonstrate the ability to support Army and Marine Corps leaders, Soldiers, and Marines with the critical capabilities of Command and Control (C2) messages, and Survivability/Entity Data messages when operating from Tactical Operational Centers (TOCs) and on-the-move in tactical vehicles. Several JBC-P software deficiencies reduced the units' ability to conduct missions and reduced Soldiers' and Marines' confidence in JBC-P situational awareness and enemy survivability alerts. While Software Build 6.0 delivered several enhanced capabilities, it introduced deficiencies that significantly detracted from mission capabilities and led to an assessment that the JBC-P was not effective. This is a reduction in capability from the November 2013, JBC-P Software Build 5.0 Initial Operational Test and Evaluation (IOT&E), which assessed the system as effective. Deficiencies included:

- Phantom Mayday messages, which provided false alerts of Soldiers or units requiring immediate assistance during Network Integration Evaluation (NIE) 14.2. With over 900 occurrences during test, this is a new JBC-P deficiency that was not experienced

during the JBC-P Software Build 5.0 IOT&E. Despite two software patches to fix this problem, Soldiers continued to experience phantom Mayday messages during NIE 15.1.

- Ghost icons, which presented false locations for blue forces. During Focus Groups, Soldiers reported that ghost icons and phantom Mayday messages reduced their confidence in the information provided by JBC-P.
- JBC-P was not effective in transmitting and receiving C2 messages. It did not meet user requirements for message completion rate within the required speed of service.

Additionally, JBC-P continued to demonstrate deficiencies during the MOT&E that were observed during the 2013 JBC-P Software Build 5.0 IOT&E and that continue to degrade user confidence in the situational awareness information provided by JBC-P. These included:

- Racing situational awareness icons that portrayed speeds up to 200 kilometers per hour (kph) during NIE 14.2, including icons for both stationary units and tactical ground forces, which normally should not exceed 70 kph. After the program attempted to fix this problem, Soldiers experienced icons lagging in accurate position by 30 minutes to one hour during NIE 15.1.
- Communications security device, KGV-72, problems that caused failures.
- Map problems that included incorrect placement of grid lines, offset up to 1,500 meters, and a zoom function that slowed JBC-P processing, at time locking up the software.

JBC-P Logistics (JBC-P Log), an integral component of the JBC-P Software Build 6.0, did not support the Army brigade's logistics mission. Soldiers experienced a low success rate in interrogating radio frequency identification (RFID) tags. JBC-P Log allowed operators to create duplicate RFID tags that portrayed the same cargo in different locations across the brigade.

JBC-P served as the brigade's tool for on-the-move mission command, yet this was primarily accomplished through the use of chat. Using JBC-P, units were able to maneuver forces to key positions while out of enemy contact, control the battle while in contact, and rejoin forces upon completion of combat operations. JBC-P supported the commander's ability to command, yet due to noted deficiencies, commanders experienced decreased confidence and support from JBC-P Software Build 6.0 compared to previous versions of JBC-P software.

The Marine Corps participation in the MOT&E demonstrated effective interoperability between the Marine Corps battalion to Army brigade, and from the Marine Corps battalion to Army battalion command echelons.

Operational Suitability

The Joint Battle Command – Platform (JBC-P) is not operationally suitable. JBC-P is not reliable for most versions of hardware hosting JBC-P Software Build 6.0. JBC-P meets the user's Mean Time To Repair (MTTR) maintainability requirement. During the MOT&E,

DOT&E evaluated the reliability, availability, and maintainability of major JBC-P system configurations employed by Army and Marine Corps units:

- Joint Version 5 (JV5)
 - Block I Computer System
 - Block II Computer System
- Military Family of Computing Systems (MFoCS)
 - MFoCS-Basic (MFoCS-B)
 - MFoCS-Intermediate (MFOCS-I)
- Tactical Operations Center (TOC) Kit
 - Dell XFR TOC
 - MFoCS-B TOC
- JBC-P Logistics (JPC-P Log)
 - Military Rugged Tablet – Plus (MRT+)
 - MRT+ Control Station (MRT+ CS, TOC)

JBC-P experienced inconsistent reliability across the spectrum of the major JBC-P system configurations. Some configurations performed well, but most did not meet the Mean Time Between Essential Function Failure (MTBEFF) requirement of 290 hours. Fifty-eight percent of JBC-P Essential Function Failures were due to software. With the exception of the JBC-P Log MRT+, all mobile JBC-P systems met the user's 80 percent operational availability requirement. While the Marine Corps XFR TOC system met the requirement, the Army's use of the XFR in a TOC did not meet the operational availability requirement.

JBC-P met the 30-minute Mean Time to Repair (MTTR) requirement for all variants of the system. Soldiers and Marines were able to maintain the system because most failures were software-related and the crew could correct them by rebooting the system without maintenance support. The reboot process requires three steps: power down, power up, and log in. The average time for a JBC-P reboot, to include system spontaneous rebooting during MOT&E, was eight minutes.

JBC-P training prepared Soldiers and Marines to install and operate their mobile and TOC systems. The Army should consider improving the training to:

- Provide sufficient time for unit collective training.
- Increase hands-on instruction.
- Increase troubleshooting instruction for maintainers.
- Provide leaders with information tailored to their command or staff position.
- Provide technical manuals to Soldiers and Marines.

The JBC-P Log training provided to Soldiers by the Army was not effective. Even with retraining at the beginning of record test, the training provided did not prepare them to operate or maintain JBC-P Log.

The Army has not developed a standard operating procedure (SOP) for employing JBC-P within units and integrating JBC-P with other Army mission command applications and databases. Signal Soldiers across the unit were challenged with the complexity of mission command applications and communications, and the unit was not manned to accomplish this task. In the case of a logistics company, the unit was not provided a signal Soldier and was forced to train an alternate Soldier to perform the required communications tasks. This solution diverted a Soldier from their primary duties to support JBC-P and other mission command applications.

Survivability

JBC-P is not survivable. The classified annex to this report details those deficiencies.

Recommendations

The Army and Marine Corps should consider the following actions to improve Joint Battle Command-Platform (JBC-P) Software Build 6.0:

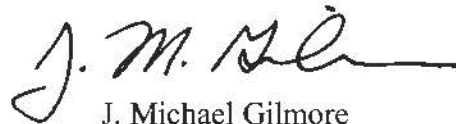
- **Improve Effectiveness.** The Army should improve JBC-P support to unit mission accomplishment and demonstrate the improvements in a future operational test.
 - Fix position location identification icon deficiencies to include false location, lagging, and racing icons.
 - Correct unit command and control alerting, i.e. eliminate phantom Mayday messages.
 - Improve shared survivability information to enable better retrieval and/or caching of relevant Entity Data Message map icons.
 - Fix map deficiencies to include zoom and grid line accuracy problems.
 - Improve the performance of the communications security device, KGV-72.
 - Improve noted JBC-P Log deficiencies.
- **Improve Reliability.** The Army should improve JBC-P's reliability and demonstrate improved reliability in an operational test prior to full materiel release and subsequent fielding of the JBC-P Software Build 6.0.
 - Identify and fix failure modes for the MRT+ and inconsistent reliability performance for the MFoCS configurations.
- **Improve Training.** The Army should improve JBC-P New Equipment Training.
 - Provide JBC-P collective training that validates both individual and unit proficiency. Expand collective training to include JBC-P Log.

- Expand the leaders' course to provide more JBC-P information tailored to the individual command/staff position to allow the full use of its mission command capabilities.

Expand the operators' course to include more hands-on training and provide more detail on trouble shooting beyond doing a system "reboot."

Include training on all JBC-P components, e.g. KGV-72 encryption device, to enable Soldiers to install, operate, and maintain the system.

- **Create a Digital Standard Operating Procedure (SOP).** The Army and Marine Corps should create a digital SOP to integrate the numerous mission command systems with their services. This document should standardize mission command operations for both tactical operational centers and on-the-move systems.
- **Increase Signal Soldier Manning.** The Army should evaluate manning of Signal Soldiers, e.g. Military Occupational Specialty 25U, across the brigade to support JBC-P and other networked systems. The Army should conduct a holistic assessment of mission command systems with accompanying communications systems and staff their units for mission success.
- **Improve Survivability.** The Army should address the deficiencies and recommendations noted in the classified annex of this report.



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Section One

System Overview

Mission Description

The Joint Battle Command – Platform (JBC-P) is a networked mission command information system that enables Army and Marine Corps' units to share near real-time friendly, enemy, and battlefield situational awareness, operational maps and graphics, and command and control (C2) messages. The Army and Marine Corps intend JBC-P to provide joint, platform-level interoperability for operations centers, ground vehicles, aviation assets, and dismounted Soldier/Marine platforms operating in land/littoral-dominated joint battle space. JBC-P expands upon the previously released Force XXI Battle Command Brigade and Below (FBCB2) and FBCB2-Joint Capability Release (FBCB2-JCR) systems and is designed to provide:

- Blue (friendly) situational awareness
- Red (enemy) situational awareness
- Network integration
- Sustainment

The Army and Marine Corps intend the JBC-P Battle Command Product Line to provide the following critical battlefield capabilities to vehicle platforms and dismounted Soldiers/Marines:

- Improved Combat Identification at the point of engagement to reduce fratricide
- Improved on-the-move situational awareness through a rapidly updated common picture of the battlefield
- Enhanced Mission Command or C2 capability over extended tactical and operational distances
- More accurate position locations of friendly units, combined with network wide dissemination of reported enemy, neutral entities, unknown entities, and terrain information

Commanders use JBC-P's situational awareness to maneuver forces to positions of battlefield advantage based upon knowledge of friendly and enemy forces. Commanders and Soldiers/Marines should experience improved support of maneuver units through enhanced situational awareness and messaging, which provides numerous benefits including greater survivability, more effective link-up of medical and vehicle recovery assets, and efficient resupply. Commanders and staff use JBC-P to conduct mission command through the exchange of orders and graphics via horizontal and vertical communications between combat vehicles and the Tactical Operations Centers (TOCs)

The Army uses JBC-P Logistics (JBC-P Log) to support unit mission logistics from select Army JBC-P Software Build 6.0 systems. JBC-P Log enables the transfer of blue force and threat data between maneuver, maneuver support, and sustainment systems. Soldiers using

JBC-P Log can identify, track, and re-route cargo vehicles as required to support the commander's mission execution.

Incremental Development

The Army established JBC-P as an incremental development program with a series of software builds that increase in capability to complete the 104 threshold requirements contained within the approved JBC-P Capabilities Development Document (CDD). On March 15, 2013, the Joint Requirements Oversight Committee approved the JBC-P CDD (used in lieu of a Capabilities Production Document). To define its increment build strategy, the Army G3/5/7 published a memorandum in May 2013 outlining the JBC-P CDD requirements to be satisfied by JBC-P Software Build 5.0 and follow-on versions.

In May 2013, the Army conducted a JBC-P Software Build 5.0 Initial Operational Test and Evaluation (IOT&E) in accordance with a DOT&E-approved test plan. The IOT&E was conducted in conjunction with the Army's Network Integration Evaluation (NIE) 13.2 in May 2013. DOT&E published an IOT&E report on JBC-P on November 22, 2013, which assessed JBC-P as operationally effective in supporting Army commanders and Soldiers with situational awareness, command and control (C2) messages, and chat when operating from Tactical Operational Centers (TOCs) and on-the-move in tactical vehicles. The report found that JBC-P was operationally effective in supporting the unit's mission success and mission utility during all 24 missions conducted during the IOT&E. The report noted that poor reliability due to frequent outages and software problems hampered operational effectiveness. The assessment found that JBC-P was not operationally suitable due to substantive reliability issues. The report also found that JBC-P was not survivable, as it had significant cybersecurity vulnerabilities that would place a unit's ability to succeed in combat at risk.

Following operational test, the Army developed JBC-P Software Build 5.1, which addressed deficiencies noted during the IOT&E, and was intended to satisfy the CDD's four Key Performance Parameters (KPPs) and over 60 percent of the threshold requirements. Based upon successful program regression testing, the Army approved a fielding decision for JBC-P Software Build 5.1 in November 2013.

The Army updated the JBC-P incremental build memo in March 2014 to define capabilities to be delivered in Software Build 6.0 for assessment during the May 2014 JBC-P Multi-Service Operational Test and Evaluation (MOT&E), which was conducted in conjunction with NIE 14.2. The Army intends for Software Build 6.0 to satisfy the JBC-P CDD's KPPs and 90 percent of threshold requirements. The Marine Corps published a memorandum that concurred with the Army's definition of required capabilities within JBC-P Software Build 6.0.

The new capabilities provided by JBC-P Software Build 6.0 include:

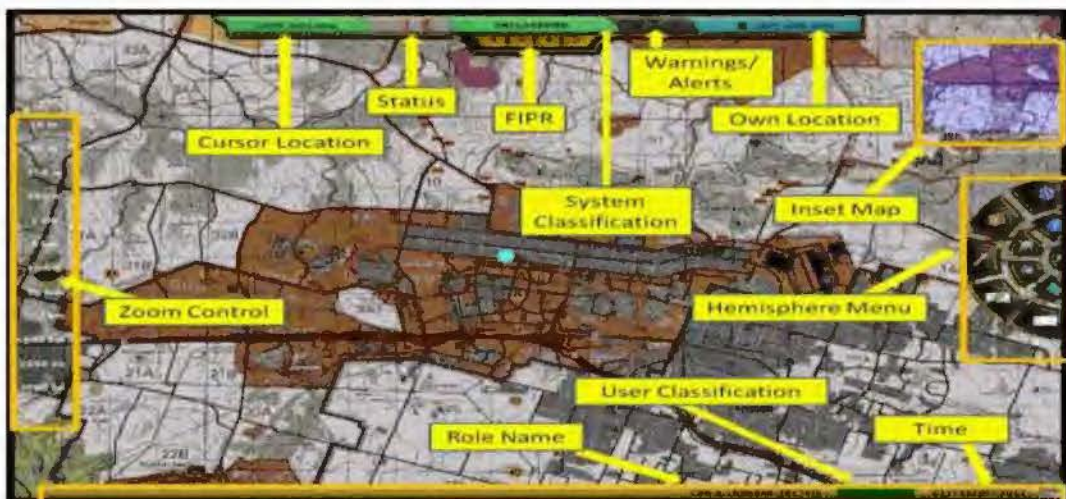
- JBC-P Log with Radio Frequency Identification (RFID) tag interrogation, and reporting and message exchange with the Battle Command Sustainment Support System (BCS3). The JBC-P Log provides logistics information to the Transportation Coordinator's Automated Information for Movement System II (*TC-AIMS II*) and the Global Combat Support System (GCSS) to enhance Army total asset visibility.

- Area Structures, Capabilities, Organizations, People, and Events (ASCOPE) reports and collections, to include search-along-route function.
- Transfer of digital pictures from dismounted Soldiers using Nett Warrior.
- Sharing of Global Positioning System (GPS) information within the combat vehicle or tactical operations center.
- Hybrid Capability – the ability of the JBC-P system to employ both celestial and terrestrial networks for exchanging mission command information.

System Description and Capabilities

JBC-P Software Build 6.0 provides the following functional capabilities as tested during the Network Integration Evaluation 14.2 JBC-P MOT&E:

- **Graphical User Interface (GUI)** – The GUI provides JBC-P’s output display and user input tools to include keyboard and touch screen capabilities (Figure 1-1). The GUI is an enhancement of the fielded FBCB2-JCR, and includes improved map functions, graphics, images, and the ability to display ASCOPE data. The GUI allows Soldiers and Marines to add overlays and icons to enhance the situational awareness, and use chat capability and messaging to support mission command.



FIPR = Flash/Immediate/Priority/Routine precedence description.

Figure 1-1. JBC-P Graphical User Interface map display.

- **Chat** – Tactical chat and chat room capability provides enhanced collaboration for commanders. Chat allows leaders to conduct planning, assist in orders development, execute missions, and decrease overall mission coordination time.



Figure 1-2. JBC-P Graphical User Interface with inset chat window.

- **Network Services Gateway (NSG)** – The NSG is an additional capability introduced with the JBC-P software to fill beyond-line-of-sight communications shortfalls within the battlefield environment. The NSG uses an internet protocol (IP) interface within a standard JBC-P computer to connect to the lower tactical internet. The transfer of C2 and situational awareness messages can be accomplished using standard military-approved IP-based waveforms (e.g. the Soldier Radio Waveform or Highband Networking Waveform) to connect JBC-P to dismounted Soldiers or adjacent vehicles by terrestrial radio.
- **Tactical Ground Reporting (TIGR)** – TIGR stores, maintains, and synchronizes ASCOPE data between the TOC and tactical vehicles.
- **Map Engine** – JBC-P’s map engine provides an improvement upon the fielded FBCB2-JCR for the display of tactical maps and images.
- **Information Exchange** – JBC-P provides blue force situational awareness updates via automatic (operator independent) maps, graphics, and overlays to tactical vehicles and TOCs. This includes all units equipped with JBC-P, FBCB2-JCR, FBCB2, and Nett Warrior-equipped dismounted Soldiers connected to the JBC-P network. JBC-P provides tools for users to add shared graphics and overlays for known enemy locations.
- **Hybrid Network Capability** – The hybrid network capability provides alternate and redundant means of communications on an intelligent basis between terrestrial and celestial transport layers. By monitoring the quality of its satellite network, the JBC-P Hybrid Network Capability is designed to automatically select the best means of communications (celestial or terrestrial), which increases network robustness during mission operations.
- **JBC-P Log Capability**– JBC-P Log provides RFID tag interrogation, reporting, and message exchange. JBC-P Log reports RFID data exchanges to the JBC-P Network

Operations Center, where it is shared with other Army logistics systems via the Movements Tracking System-Enhanced Software (MTS-ES). This exchange allows logisticians to track the worldwide location of cargoes and equipment in near-real time.

The Army and Marine Corps host JBC-P Software Build 6.0 on several different computer systems with supporting hardware. During MOT&E, Soldiers and Marines employed the computer systems and hardware described in the paragraphs below. Note, the first six paragraphs describe host computers while the remaining items and software support JBC-P operations.

Mounted Refresh Computer (MRC)

The Marine Corps MRC (Figure 1-3) supports both vehicle-mounted (left side of figure) and TOC kit (right side of figure) operations. The mounted systems are fielded in both terrestrial and celestial configurations.

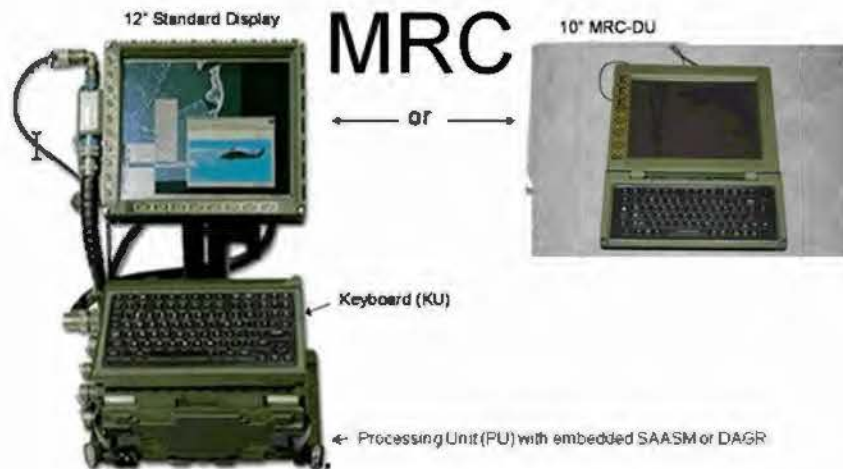


Figure 1-3. Marine Corps Mounted Refresh Computer

Joint Tactical Common Operational Picture (COP) Workstation (JTCW)

The JTCW (Figure 1-4) is a windows-based suite of applications designed to provide Marine Corps battalion and above echelons with command and control functions, improved situational awareness and enhanced operational and tactical decision-making. The JTCW serves as the COP interface between the JBC-P and Marine Corps workstations at battalion and above.



Figure 1-4. Dell XFR computers hosting the JTCW suite of applications in a Marine Corps command post

Joint Version 5 (JV5) Block 1 and JV5 Block 2 Computers

The JV5 Block 1 and JV5 Block 2 (Figures 1-5 and 1-6) are JBC-P host computer systems with display units. The JV5 Block 2 is an upgrade of the JV5 Block 1 that provides a faster computer processing unit, increased Random Access Memory (RAM) and hard disk storage, and improved graphics.



Figure 1-5. JBC-P JV5 Block 2 display and keyboard



Figure 1-6. Commander using a JBC-P JV5 Block 2 on a Multi-Domain Atlas display

Mounted Family of Computing Systems (MFoCS) –Basic and Intermediate

The MFoCS (Figure 1-7) is the Army's computer hardware upgrade for the JV5 Block 1 and JV5 Block 2 computers. MFoCS includes advanced computing technologies with improved processing capability to include high-definition graphics, higher-capacity hard drives, and additional memory. The MFoCS consists of three configurations – MFoCS Basic (TOC systems); MFoCS Basic and Intermediate (vehicle-mounted systems), and MFoCS Advanced (user or mission dictates this higher capability). These three systems consist of common line replaceable units and are compatible with existing JV5 installation kits, keyboards, and displays. MFoCS' modularity of design enables Soldiers to configure their systems for specific

applications (i.e., JBC-P, JBC-P Log, TIGR, Command Post of the Future, Distributed Common Ground System – Army, Advanced Field Artillery Tactical Data System) based upon mission needs.



Figure 1-7. Mounted Family of Computing Systems used in JBC-P.

Tactical Operations Center (TOC) Kit – Dell XFR Computer

TOC Kits (Figure 1-8) provide JBC-P mission command and situational awareness to commanders within command posts. A TOC kit consists of a Dell XFR laptop hosting JBC-P software, a Defense Advance GPS Receiver (DAGR), a Blue Force Tracker 2 (BFT2) satellite transceiver, and a KGV-72 encryption device (see following paragraphs for descriptions). The Marine Corps TOC kit is identical to the Army version.



Figure 1-8. JBC-P TOC Kit

Military Rugged Tablet – Plus (MRT+)

The MRT+ (Figure 1-9) is a ruggedized computer tablet that supports the functions of JBC-P Log within an Army TOC. The MRT+ provides computer processing capabilities in a compact form and uses a 10.4” display.



Figure 1-9. Military Rugged Tablet - Plus

Blue Force Tracker (BFT) 2 Transceiver

JBC-P uses an L-band satellite (950-2150 Megahertz (MHz)) transceiver (see Figure 1-10) to support a shared 80 to 90 kilobits per second (kbps) data uplink and downlink within its supporting satellite footprint. BFT2's increased throughput (over the earlier BFT1) allows JBC-P to receive more frequent updates and provide more accurate situational awareness for Soldiers and Marines. The Army plans to field a BFT2 transceiver with each vehicle and fixed location JBC-P. The Marine Corps intends to field a mix of BFT2 and terrestrial radios to support JBC-P.



Figure 1-10. Blue Force Tracker Satellite Transceiver

KGV-72 Type I Programmable In-Line Encryption Device

The KGV-72 (Figure 1-11) provides communications data encryption and ensures that BFT2 transmissions are certified to support Secret transmissions for JBC-P, FBCB2-JCR, and FBCB2.



Figure 1-11. (Left) KGV- 72 Type 1 Programmable In-Line Encryption Device and (Right) a KGV-72 (with lock, above, front, left) located above front left of a platoon leader.

Defense Advanced Global Positioning System (GPS) Receiver (DAGR)

The DAGR (Figure 1-12) is a handheld GPS receiver that serves as a component of the JBC-P vehicle and TOC systems. It is a military-grade, dual-frequency receiver, and maintains the security hardware necessary to decode military band, encrypted P(Y)-code GPS signals.



Figure 1-12. Company Commander using the JBC-P with DAGR

BFT2 with RFID Interrogator

The BFT2 transceiver coupled with an RFID interrogator (Figure 1-13) allows JBC-P Log to use wireless transfer of data to enable automatic identification and tracking of RFID tags attached to objects and cargoes.



Figure 1-13. BFT transceiver with the RFID interrogator in the top left corner.

Network Operations Center (NOC)

The JBC-P Network Operations Center (NOC) (Figure 1-14) provides the central routing capability for the JBC-P system. The NOC provides the network interface between celestial (satellite) and terrestrial (radio) based platforms in the FBCB2-JCR and JBC-P networks. The NOC receives transmitted information and re-broadcasts it to worldwide recipient systems in combat vehicles and command posts. The JBC-P system cannot function without the central routing provided by the NOC.



Figure 1-14. JBC-P Network Operations Center

Section Two Test Adequacy

Operational Testing

The Multi-Service Operational Test and Evaluation (MOT&E) of the Joint Battle Command – Platform (JBC-P) Software Build 6.0 was adequate to assess JBC-P operational effectiveness, suitability, and survivability. The Army Test and Evaluation Command (ATEC) conducted the operational test in accordance with a DOT&E-approved test plan to support the following proposed JBC-P Software Build 6.0 decisions:

- 1QFY15 Army materiel release decision
- 2QFY15 Marine Corps fielding decision

The Army approved a fielding decision for JBC-P Software Build 5.1 in November 2013 based upon a May 2013 JBC-P Initial Operational Test and Evaluation (IOT&E) and subsequent program regression testing.

ATEC conducted the JBC-P MOT&E from April 28 through May 17, 2014, as part of the Army’s Network Integration Evaluation (NIE) 14.2 at Fort Bliss, Texas. At NIE 15.1, October 15 through November 2, 2014, ATEC conducted surveys and interviews to assess software fixes of deficiencies noted during MOT&E.

The JBC-P system with Software Build 6.0 is projected for fielding as part of the Army’s Capability Set 15. JBC-P is an Acquisition Category II program with DOT&E oversight. The MOT&E included the JBC-P and Force XXI Battle Command Brigade and Below (FBCB2) Joint Capability Release (JCR) Network Operations Centers (NOCs) at Aberdeen Proving Ground, Maryland. This evaluation is based upon the JBC-P MOT&E supplemented by prior developmental testing that occurred during the JBC-P Risk Reduction Event 14, Government Developmental Test, and Regression Test. The developmental and operational test dates and the events that led up to the MOT&E appear in Table 2-1.

Table 2-1. Test Schedule

Activity	Date
New Equipment Training	February 3 – March 28, 2014
Step 4, Operational Information Assurance/Cyber Security Vulnerability Evaluation	March 10 – April 4, 2014
Pilot Test	April 28 – May 2, 2014
Record Test	May 6–17, 2014
Regression Testing of Fixes and Survey/Interviews with Soldiers	October 15-November 2, 2014

The MOT&E provided adequate data to assess the effectiveness of the JBC-P. The Army installed instrumentation to collect data on sent and received situational awareness and command

and control (C2) messages, and installed military data collectors in vehicles and facilities. There were a total of 282 JBC-P systems in the NIE. Of these, there were 63 JBC-P systems (56 Army and 7 Marine Corps) operating in combat vehicles and TOCs that were instrumented to capture situational awareness messages, C2 messages, and survivability messages.

The test unit, 2nd Brigade, 1st Armored Division (2-1 AD), at Fort Bliss/White Sands Missile Range, is a heavy brigade combat team that provided a brigade headquarters and six battalions to perform missions under operationally realistic conditions. The brigade employed a mix of JBC-P, FBCB2 JCR, and FBCB2 Version 6.5 systems to provide the unit's situational awareness, chat, and C2 messaging. Within this combined network, the brigade deployed 56 instrumented JBC-P systems in the Brigade Headquarters, the 4th Battalion, 17th Infantry (4-17 IN); the 1st Squadron, 1st Cavalry Regiment (1-1 CAV); and the 47th Brigade Support Battalion (47 BSB). The NOC at Aberdeen Proving Ground, Maryland, is a fixed facility that provides worldwide support and interoperability of JBC-P, FBCB2 JCR, and FBCB2 Version 6.5 networks under operational, training, and testing environments. For MOT&E, a test/training NOC, operating alongside the real-world NOC, maintained two instrumented systems.

The Marine Corps unit, 2-8th Infantry Battalion (2-8 Marines), was attached to the Army brigade and employed seven instrumented JBC-P systems. The 2-8th employed three instrumented infantry company combat vehicles equipped with terrestrial-capable JBC-P systems and four instrumented weapons company celestial-capable JBC-P systems. The MOT&E Army and Marine Corps test units conducted operationally realistic scenarios to include offensive, defensive, and stability missions employed at-the-halt and on-the-move.

The Army and Marine Corps embedded military data collectors in 79 combat vehicles, 2 NOCs, 3 Tactical Operations Centers (TOCs), and 2 Military Rugged Tablet Control Stations to capture reliability data and document these in Test Incident Reports. Following test completion, ATEC recognized from the duty logs that data collectors had not provided all test incidents for the reliability evaluation. ATEC reassessed the data logs compared to instrumented data to create a complete reliability assessment.

The MOT&E instrumented and collected data on six TOCs (3 Dell XFRs and 3 Mounted Family of Computing Systems-Basic) and the JBC-P/JCR test NOCs. Due to the low density of these systems, data collection yielded insufficient operating hours for a meaningful reliability assessment.

The MOT&E was adequate to address the joint interoperability between the Army and Marines in an integrated scenario with an Army brigade and elements of a Marine Corps Regiment engaged in joint operational scenarios.

The MOT&E collected manual data to include a blue ribbon panel for mission effectiveness assessment, mission interviews, video-recorded focus groups, test participant structured interviews, test team observations, and subject matter expert comments.

Test Scenario

The JBC-P Operational Mode Summary/Mission Profile (OMS/MP) focuses on a single Wartime Mission Profile, 72- hour Major Combat Operations (MCO), for selected combat

platforms within, or in direct support of, the Heavy Brigade Combat Team (HBCT). The MCO represents the most strenuous profile for Unified Land Operations during which combat operations are conducted by all HBCT echelons. The MOT&E stressed Army and Marine Corps JBC-P systems within the brigade during a 12-day operational test, which included realistic missions and scenarios. The 1-1 CAV was the primary unit under test, operating as a cavalry unit, performing screen and reconnaissance missions, and conducting limited attacks. The 4-17 IN employed JBC-P systems and conducted appropriate missions. Between these two units, the MOT&E collected sufficient data to assess mission performance. The test units executed decisive action operations that included offensive, defensive, and stability missions employed at-the-halt and on-the-move. The 2-8 Marines were under the operational control of the 2-1 Brigade and conducted appropriate missions. The 47 BSB conducted operational missions to assess JBC-P Log capabilities. The Brigade Modernization Command served as the division headquarters and issued warning orders, fragmentary orders, and operations orders to transition the test through scenario phases. ATEC designed each phase in accordance with the requirements of the 72-hour OMS/MP.

Unit Task Reorganization (UTR) is a core JBC-P function and is planned by the brigade commander or S-3 and executed by the S-6. The Brigade executed 14 UTRs at the platoon, company, battalion, and regiment echelons, including cross-Service UTRs (i.e., Army to Army and Army to Marine Corps and vice versa):

- 2-8 Marines into (and back out of) the 2-1 AD
- F Company, 2-8 Marines into (and back out of) 1-6 IN
- C Troop, 1-1 CAV into (and back out of) 4-17 IN
- D Company, 1-6 IN and 1-1 CAV into (and back out of) 2-8 Marines

Information Assurance

Prior to and during the MOT&E, the Army Research Laboratory Survivability/Lethality Analysis Directorate (ARL/SLAD) conducted Information Assurance assessments on JBC-P that included:

- Step 4 – Operational Information Assurance Vulnerability Evaluation
- Step 5 – Protect, Detect, React, and Restore Evaluation

These tests were performed in accordance with the DOT&E memorandum “Procedures for Operational Test and Evaluation of Information Assurance in Acquisition Programs,” dated January 21, 2009, and included clarifications and improvements published in November 2010 and February 2013.

Electronic Warfare

During the MOT&E, electronic warfare testing consisted of open-air jamming and direction finding operations. The Threat Systems Management Office provided and operated the jamming, direction finding, and GPS-imitating equipment to support the multiple 72-hour scenarios in an electronic warfare environment. All threats portrayed were in accordance with

the accredited threat for JBC-P. Electronic warfare was focused on Marine Corps units, since the Army units received an electronic warfare assessment during the NIE 13.2 JBC-P IOT&E.

System Support

Field Service Representatives (FSRs) participated in the MOT&E as sustainment-level maintenance. FSR support of the operation and maintenance during the JBC-P MOT&E was in accordance with the maintenance support concept for a heavy brigade combat team. The Army program office provided two FSRs for the JBC-P MOT&E, one to service the battalions and one at brigade.

Net Ready Key Performance Parameter

The Army and Marine Corps tested JBC-P Software Build 6.0 to assess the Net Ready Key Performance Parameter. The JBC-P MOT&E assessed JBC-P for backward compatibility with FBCB2 versions 6.5 and JCR, as well as interoperability with the Marine Corps.

Joint Interoperability Certification (JIC) and Army Interoperability Certification (AIC) are required to ensure the system meets approved technical standards and information exchange requirements, and does not introduce vulnerabilities or reduce service when connected to active networks. The Joint Interoperability Test Command assessed JBC-P Software Build 6.0 for JIC during the JBC-P MOT&E. The Army completed the JBC-P Software Build 6.0 AIC during 3/4QFY14 to meet the requirements of the Net Ready Key Performance Parameter. The AIC will also assess compliance of the JBC-P software message set to Military Standard 6017A, which is the Department of Defense standard for Variable Message Format (VMF) messages.

Section Three Effectiveness

The Joint Battle Command – Platform (JBC-P) Software Build 6.0 is not operationally effective. It did not demonstrate the ability to support Army and Marine Corps leaders, Soldiers, and Marines with the user's requirements for Command and Control (C2) messages, and Survivability/Entity Data messages when operating from Tactical Operational Centers (TOCs) and on-the-move in tactical vehicles. Several JBC-P software deficiencies reduced the units' ability to conduct missions and reduced Soldiers' and Marines' confidence in JBC-P situational awareness and enemy survivability alerts. While Software Build 6.0 delivered several enhanced capabilities, it introduced deficiencies that significantly detracted from mission capabilities and led to an assessment that the JBC-P was not effective. This is a reduction in capability from the November 2013, JBC-P Software Build 5.0 Initial Operational Test and Evaluation (IOT&E), which assessed the system as effective. These deficiencies included:

- Phantom Mayday messages, which provided false alerts of Soldiers or units requiring immediate assistance during Network Integration Evaluation (NIE) 14.2. With over 900 occurrences during the JBC-P Software Build 6.0 Multi-Service Operational Test and Evaluation (MOT&E), this is a new JBC-P deficiency that was not experienced during the JBC-P IOT&E. Despite two software patches to fix this problem, Soldiers continued to experience phantom Mayday messages during the subsequent NIE 15.1.
- Ghost icons, which presented false locations for blue forces. During Focus Groups, Soldiers reported that ghost icons and phantom Mayday messages reduced their confidence in the information provided by JBC-P.
- JBC-P was not effective in transmitting and receiving C2 messages. It did not meet user requirements for message completion rate within the required speed of service.

Additionally, JBC-P continued to demonstrate deficiencies during MOT&E that were observed during the 2013 JBC-P IOT&E and that continue to degrade user confidence in the situational awareness information provided by JBC-P. These included:

- Racing situational awareness icons that portrayed speeds up to 200 kilometers per hour (kph) during the JBC-P MOT&E, including icons for both stationary units and tactical ground forces, which normally should not exceed 70 kph. After the program attempted to fix this problem, Soldiers experienced icons lagging in accurate position location by 30 minutes to one hour during NIE 15.1.
- Communications security device, KGV-72, problems that caused failures.
- Map problems that included incorrect placement of grid lines, offset up to 1,500 meters, and a zoom function that slowed JBC-P processing, at time locking up the software.

JBC-P Logistics (JBC-P Log), an integral component of the JBC-P Software Build 6.0, did not support the Army brigade's logistics mission. Soldiers experienced a low success rate in

interrogating radio frequency identification (RFID) tags, and JBC-P Log allowed operators to create duplicate RFID tags that portrayed the same cargo in different locations across the brigade. JBC-P Log software is not mature, and the identified problems distracted from the unit's logistics mission.

JBC-P served as the brigade's tool for on-the-move mission command, yet this was primarily accomplished through the use of chat, a legacy capability. Using JBC-P, units were able to maneuver forces to key positions while out of enemy contact, control the battle while in contact, and rejoin forces upon completion of combat operations. JBC-P supported the commander's ability to command, yet due to noted deficiencies, commanders experienced decreased confidence and support from JBC-P Software Build 6.0 compared to previous versions of JBC-P software.

JBC-P met technical requirements for the timely transfer of position location information. Nonetheless, the MOT&E highlighted serious deficiencies in situational awareness which included racing icons, inaccurate position location, and phantom Mayday messages that caused Soldiers to lose confidence in the system. The unit's lack of confidence in JBC-P situational awareness forced Soldiers to confirm blue force locations through the use of alternate communications such as chat and combat net radio.

As stated, JBC-P was not effective in transmitting and receiving C2 messages. It did not meet user requirements for message completion rate within the required speed of service. The JBC-P chat capability supported commanders in the planning and execution of missions. Chat provided leaders the ability to execute mission command across all levels within the brigade. Although improved since the JBC-P IOT&E, poor reliability due to frequent outages and software problems continued to hamper operational effectiveness. The Marine Corps participated as an attached unit in the MOT&E, and JBC-P demonstrated the capability to operate in the joint operational environment as described in the user's requirement Key Performance Parameter.

Shared Blue Situational Awareness

JBC-P exceeded the user's technical requirements (primarily, timeliness of message transmission) for the display of friendly force situational awareness for leaders and Soldiers/Marines on-the-move and at-the-halt. Although JBC-P met the user's requirements, Soldiers and Marines experienced decreased confidence in the provided situational awareness due to racing icons, inaccurate position location, and phantom Mayday messages (which generated false icons); thus, although timely, situational awareness was inaccurate. Table 3-1 shows the friendly or blue force visibility. Visibility rates show the percentage of situational awareness information received within a time and distance set by the user's requirement. Units using JBC-P experienced situational awareness of blue (friendly) forces through the use of an improved interface and higher resolution maps. For test purposes, vehicle-borne JBC-P systems are defined as "movers" and TOC kits are "stationary." As the number of samples for each case was large (15 thousand to 2.7 million), the stated success rate is statistically significant and a confidence region is not appropriate.

Table 3-1. JBC-P Blue Force Visibility Rates

Cases (JBC-P to JBC-P)	Requirement to be Seen within <u>xx</u> Seconds	Immediate (<5 km) Required > 75%		Extended (5-10 km) Required > 65%		Beyond (>10 km) No User Requirement	
		IOT&E (NIE 13.2) Build 5.0	MOT&E (NIE 14.2) Build 6.0	IOT&E (NIE 13.2) Build 5.0	MOT&E (NIE 14.2) Build 6.0	IOT&E (NIE 13.2) Build 5.0	MOT&E (NIE 14.2) Build 6.0
		Mover to Mover	8	91.7%	87.2%	88.4%	81.6%
Mover to Stationary	8	90.2%	77.7%	90.1%	81.9%	86.3%	68.6%
Stationary to Mover	1,200	93.9%	85.4%	94.3%	89.2%	93.9%	83.3%
Stationary to Stationary	1,200	91.3%	90.3%	97.7%	94.7%	92.3%	95.1%

Note: 80% confidence bounds for all percentages in table are within +/- 0.4% of the point estimate due to the large sample sizes of instrumented data (15K – 2.7M samples).

The JBC-P continued to provide blue force situational awareness across the network at completion rates above the user’s requirements, but at rates lower than demonstrated at the JBC-P Software Build 5.0 IOT&E. The lower rates seen during MOT&E (compared to IOT&E) may be the result of an increased number of unclassified systems sharing situational awareness messages. The exchange of messages between classified and unclassified systems requires transfer between JBC-P and JCR Network Operations Centers (NOCs), which delays message completion. Test instrumentation does not allow discrimination between the classified and unclassified messages.

Commanders and Soldiers/Marines noted JBC-P problems with “racing” icons moving at high speeds across the area of operations and “ghost” icons displayed in a location that did not match their actual position location. At times, JBC-P’s display of situational awareness icons was inaccurate or moving at high rates of speed, and detracted from the unit’s ability to accomplish its mission. Moving icons included stationary TOCs, some moving at speeds up to 200 kilometers per hour. For most of the “ghost” icons, operators could physically see adjacent platforms and recognize the icon on the map was in the wrong place, as it would be well outside viewing range as depicted. Additional “ghost” icons were identified when communicating with units and noting a discrepancy in their location. When encountering these problems, Soldiers and Marines lost confidence in JBC-P and had to contact the unit by chat or radio communications to determine its actual location.

To illustrate racing icons, Table 3-2 shows the distribution of situational awareness messages by sender type and state of movement. Each situational awareness message reports position location with speed. There were 5,737 of 246,873 messages (2.3 percent) that reported TOCs moving at speeds greater than 0 kilometers per hour, with speeds ranging from 0 to 200 kph. This is not possible because when a TOC displaces, the JBC-P system is turned off and

stowed as cargo for movement. Figures 3-1 and 3-2 provide a breakdown of movement speeds for JBC-P vehicles and stationary TOCs. While tactical vehicle speeds should not exceed 70 KPH under normal operations, JBC-P provided over 3,200 situational awareness messages that reported vehicles moving at speeds ranging from greater than 70 to 200 KPH (Figure 3-1). While JBC-P TOC kits do not produce situational awareness messages on the move, JBC-P provided over 5,700 situational awareness messages that reported TOCs moving at speeds ranging between 0 and 200 KPH (Figure 3-2). JBC-P Software Build 5.0 experienced this deficiency during the JBC-P IOT&E. During the subsequent NIE 15.1, JBC-P continued to experience this problem.

Table 3-2. State of Situational Awareness Senders by Movement Type

Types	Number	0 KPH	>0 KPH
Vehicles	2,978,994 (92.3%)	2,534,577 (85.1%)	444,417 (14.9%)
TOCs	246,873 (7.7%)	241,136 (97.7%)	5,737 (2.3%)
Total	3,225,867	2,775,713	450,154

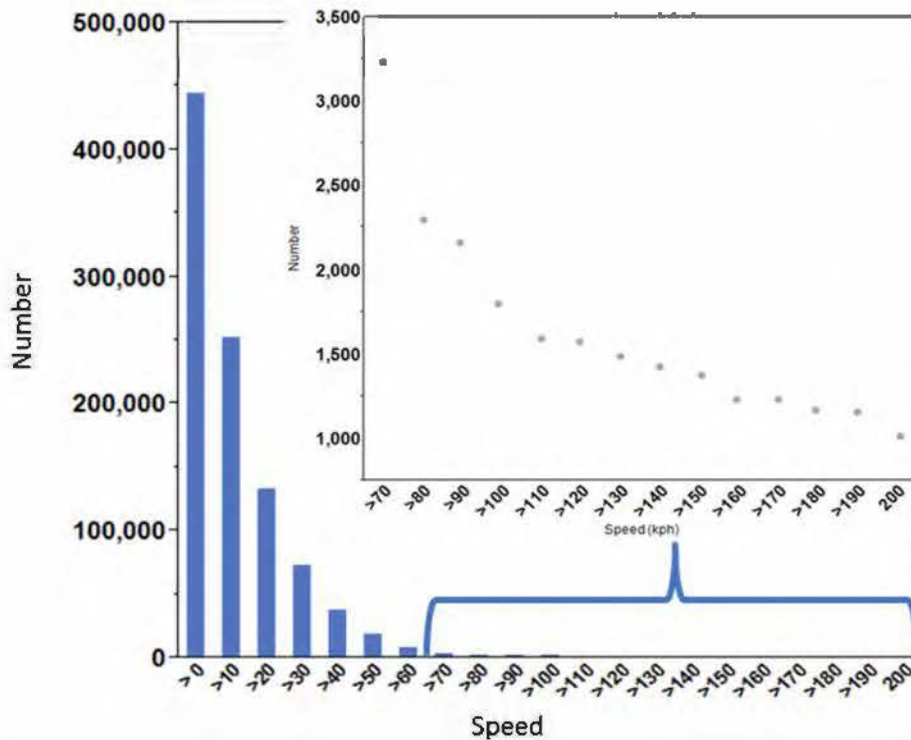


Figure 3-1. Vehicle Situational Awareness messages with speeds greater than zero.

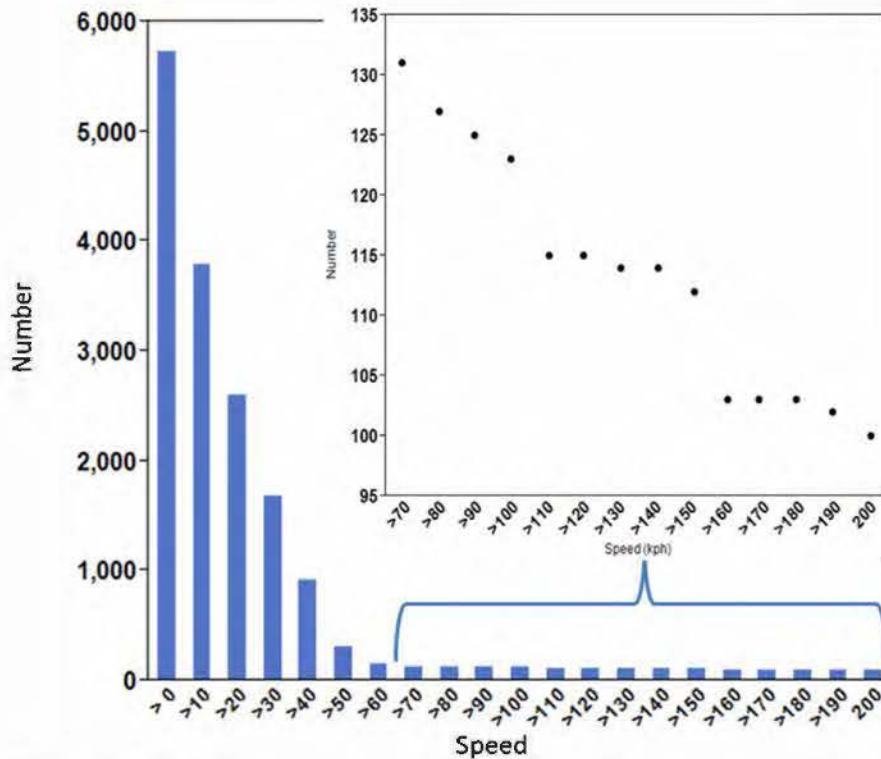


Figure 3-2. TOC Situational Awareness messages with speeds greater than zero.

JBC-P displayed joint position location information. The Marine Corp unit displayed Army platform locations and vice versa. The 2-8 Marines use of JBC-P enabled situational awareness of Army units within their area of operations prior to receiving the information from higher headquarters.

During NIE 15.1, JBC-P displayed situational awareness icons that were lagging by 30 minutes to one hour. Soldiers noted this problem during road marches and unit movements. During the last three days of NIE 15.1, the program office installed a software patch to one maneuver company to adjust the central processing unit utilization. This effort reduced the lag time of situational awareness icons to 2-3 minutes, but introduced an additional delay of images and graphics. Soldiers did not have confidence in the situational awareness provided by JBC-P, and confirmed locations by other communications means such as JBC-P chat and combat net radio.

Command and Control (C2) Messaging

Commanders and Soldiers/Marines using JBC-P were able to send and receive C2 messages in support of combat operations. Nonetheless, during MOT&E, JBC-P demonstrated message completion rates below the user's requirement for Reports and Survivability messages (comparable to the IOT&E). Table 3-3 and Figure 3-4 show the demonstrated message completion rates of C2 messages with speed of service compared to the user's requirement and demonstrated performance from IOT&E. JBC-P did not meet the user's requirement for sending and receiving Survivability, Reports, and Planning C2 messages. The assessment of Fires C2

message data is not conclusive due to a small sample size. Although JBC-P did not meet its requirement, units did not experience reduced mission effectiveness due to the availability of alternate communications means, redundancy of JBC-P systems and the network's resending of messages.

Table 3-3. JBC-P Message Completion Rates within Speed of Service

Observed Message Categories	Message Completion Rate (MCR) w/in Speed of Service (SOS) Requirement	IOT&E	MOT&E		
		MCR w/in SOS	Unique Sample Messages	Overall MCR	MCR w/in SOS (80% Confidence Bound)
Survivability	95% < 15 seconds	81.8%	961	83.3%	81.9% (80.1% - 83.4%)
	Mayday		930	82.9%	81.9%
	MEDEVAC		31	96.8%	93.6%
Fires	90% < 15 seconds	----	7	100%	100%
Reports	90% < 30 seconds	86.0%	8,698	93.7%	88.3% (87.8% - 88.7%)
	Free Text		4,914	93.8%	87.4%
	Situation Report		2,136	96.5%	94.1%
	Overlay		966	88.6%	82.4%
	Other		682	90.1%	85.0%
Planning	90% < 900 seconds	----	167	88.0%	88.0% (84.1% - 91.1%)

JBC-P software supports four types of C2 messages: Survivability, Fires, Reports, and Planning. During the MOT&E, commanders and Soldiers/Marines used Survivability, Reports, and Planning messages, with Reports messages used most often. As shown in Table 3-3 above, the most common Reports message was the Free Text message (56 percent of messages) followed by Situation Report (25 percent of messages). The Survivability messages were predominately Mayday messages, which presented a significant problem during the MOT&E due to false messages (see discussion below). Commanders and Soldiers/Marines used Planning messages to transmit operations and fragmentary orders. Commanders and Soldiers/Marines preferred to use chat for many of the functions intended for C2 messages. Chat is the primary tool for conducting on-the-move C2 within the brigade. This does not represent a reduction in C2 effectiveness, but represents Soldiers/Marines using JBC-P in an innovative manner not envisioned during the creation of the user requirement.

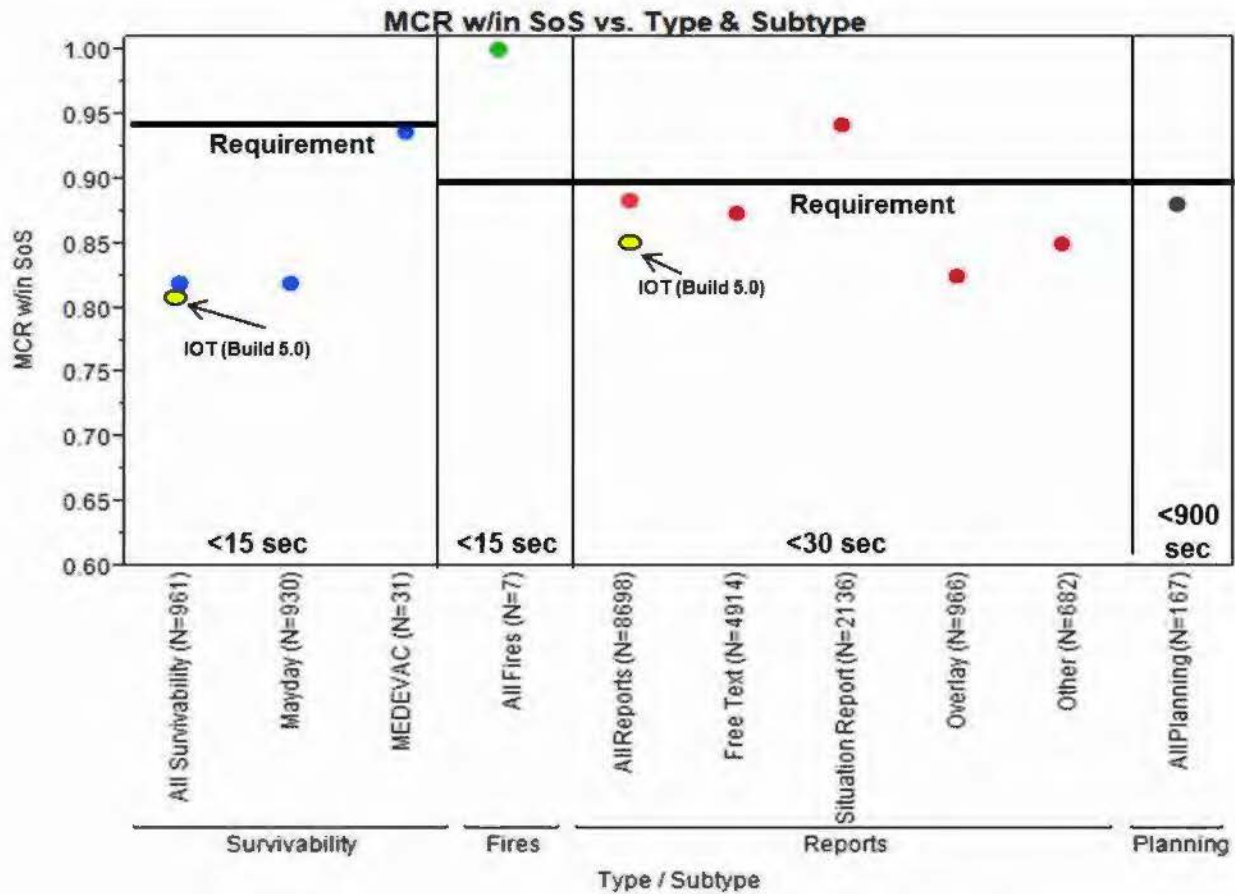


Figure 3-3. JBC-P Message Completion Rates within Speed of Service for Various Message Types and Sub-Types

JBC-P has a major deficiency with “phantom” Mayday messages. Soldiers and Marines send a Mayday message when the tactical situation demands immediate assistance for a unit under duress. All of the 930 Mayday messages seen during MOT&E were false messages generated from multiple systems (both moving and stationary) without the operator’s knowledge or initiation. Soldiers in focus groups and interviews stated that they did not use this function (i.e. initiate Maydays) during missions, meaning that all of the Mayday messages observed during the MOT&E were phantom messages. Soldiers and Marines receiving phantom Mayday messages lost confidence in JBC-P. Since they did not know if the Mayday messages were real, Soldiers/Marines had to contact the originator of each message to determine authenticity. Phantom Mayday messages increased the operator’s workload to verify status, and cluttered the display with false icons (up to 50 at a time), which obstructed the view of valid information and required user effort to clear the screen. This is a new problem in JBC-P Software Build 6.0, as no Mayday messages were transmitted or observed during the IOT&E.

During NIE 15.1, Soldiers continued to experience phantom Mayday messages despite two software patches to fix the problem. The program office installed the first software patch to reduce the frequency of the self-generated Mayday messages and the second to require a two-step process for the Mayday “hot button” (to prevent the operator hitting the button in error).

Soldiers reported they did not send intentional Mayday messages during NIE 15.1, yet the problem of phantom Mayday messages continued. The Army should fix this deficiency and verify the correction in an operational test prior to fielding JBC-P Software Build 6.0.

Shared Survivability/Entity Data Messages

JBC-P Software Build 6.0 demonstrated poor message completion rates within speeds of service, well below the user requirement, for Shared Survivability data of battlefield hazards. A subset of C2 messages (e.g. Alert, Warning, Bridge, Obstacle, Enemy Location, Hazard Area, and Supply Location) generate Shared Survivability data, termed Entity Data Messages (EDMs), and broadcast these to other platforms within a geographic radius known as the danger zone. Danger zones vary in radial distance from 5 to 40 kilometers. This is based upon the threat contained within the survivability message, e.g. artillery has a 40-kilometer danger zone while an improvised explosive device (IED) has a 10-kilometer danger zone. The user requirement defines the transfer of Shared Survivability data to 75 percent of the systems within the danger zone must occur in less than 15 seconds.

During the JBC-P IOT&E, Software Build 5.0 met the Shared Survivability/EDM data requirement. JBC-P Build 6.0 modified the dissemination of Shared Survivability/EDM data to include both NOC dissemination (as with Build 5.0) and the transfer of messages across the JBC-Ps' Network Services Gateway (NSG) using both terrestrial and satellite transmissions. The Army changed the dissemination of messages to gain access to a wider group of recipients in a shorter time period.

Table 3-4 displays the distribution of message completion rates for Shared Survivability/EDM data sent during the MOT&E assessed by visibility within the danger zone and speed of service with associated transmission path.

Table 3-4. Distribution of Survivability EDM Visibility within Danger Zones

EDM Transmission Path	Total EDM w/in DZs (MCR & SOS data)		Visible w/in DZ – (Requirement = 75% within 15 seconds)		
	IOT&E (NIE 13.2) Build 5.0 *	MOT&E (NIE 14.2) Build 6.0	IOT&E (NIE 13.2) Build 5.0	MOT&E (NIE 14.2) Build 6.0	
				MCR	MCR w/in 15 seconds
Original JBC-P Transmission	1,018	482	84%	42.7%	40.9%
JBC-P NSG Re-Dissemination	----	3,844	----	84.1%	71.5%
Sub-Total	1,018	4,326	84%	79.5%	68.1%
NOC Re-Dissemination	84,652 *	6,540	99%	74.5%	46.1%
Total	85,670	10,866	99%	76.5%	54.9%

MCR – Message Completion Rate; SOS – Speed of Service; EDM – Entity Data Message

* Message count methodology in IOT&E (NIE 13.2) was different from MOT&E (NIE 14.2).

JBC-P Software Build 6.0 demonstrated poor performance of the Shared Survivability/EDM capability, providing a 40.9 percent completion rate from sender to receiver within required time and danger zone distance compared to a user requirement of 75 percent. The NSG re-disseminations provided a better message completion rate within an additional 15 seconds, demonstrating a rate of 71.5 percent, but even with an additional 15 seconds, this rate still does not meet the basic user requirement of 75 percent of EDMs being displayed within 15 seconds. The combined rate for the original transmission and the NSG re-dissemination was 68.1 percent. In order to meet a 75 percent completion rate, JBC-P required 12 to 15 minutes to deliver Shared Survivability/EDM data within its prescribed danger zone (well beyond the 15-second requirement).

The user intends that Shared Survivability/EDM data are shared quickly and efficiently within the prescribed danger zone. Receiving an EDM within 12 to 15 minutes might be acceptable for a damaged bridge across a 40-kilometer danger zone, but would not be acceptable for an IED within 5 kilometers in a danger zone. The Shared Survivability/EDM data problem should be fixed prior to fielding.

The types of Survivability/EDMs are displayed in Figure 3-5. The data show that leaders and Soldiers/Marines generated 77 percent of their EDMs with Maneuver Platforms/Ground Vehicle/Mortars Survivability messages.

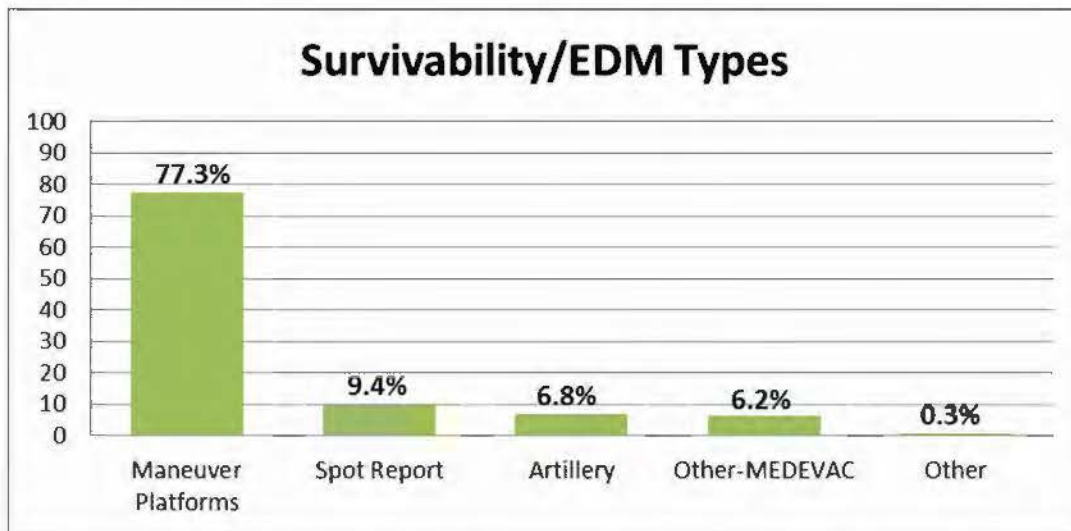


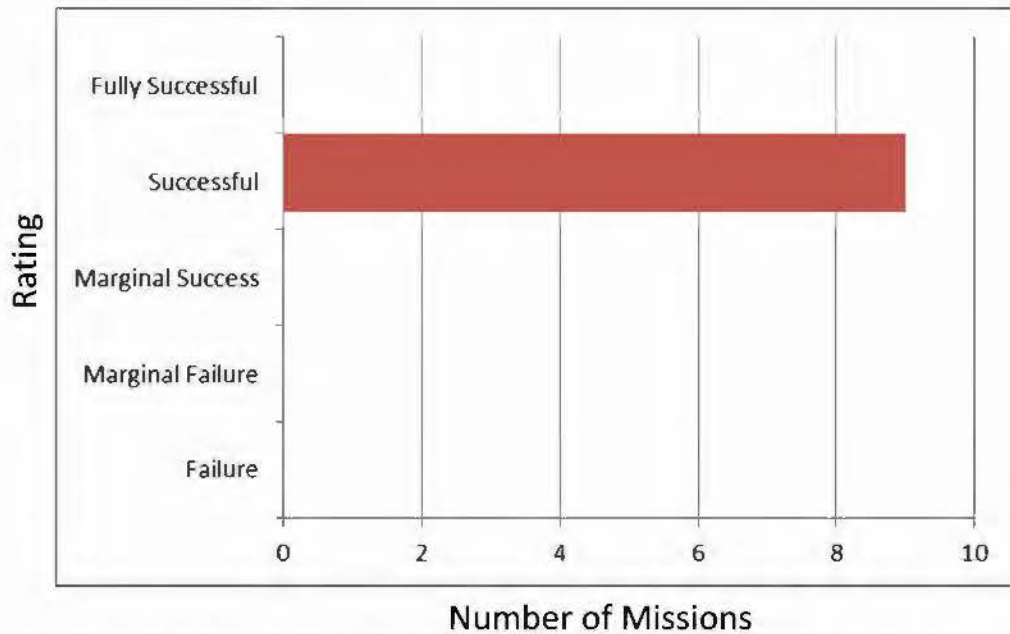
Figure 3-4. Types of Survivability/Entity Data Messages Used During MOT&E

JBC-P’s management of EDMs is not effective. The number of EDMs displayed on the JBC-P confused Soldiers. Danger zone distances are based on the effective range of the indicated threats and over time resulted in so many warnings that Soldiers “tuned them out.” Another problem with the icons and their alerts was the duration of the icons. The common Spot Report EDM (used to send intelligence or event status) had a default time frame to disappear after 12 hours. All other EDM icons (such as IED, generated from an IED or Bridge Report) remained current until deleted. Without techniques and procedures to maintain the JBC-P EDM information, the displays became cluttered with icons, which Soldiers ignored as not current. The Army and Marines should improve their procedures to maintain the threat situational awareness provided by Shared Survivability messages and EDMs. A unit digital standard operating procedure for management of enemy situational awareness information combined with appropriate training would enhance the effectiveness of JBC-P’s red (enemy) situational awareness.

Force Effectiveness

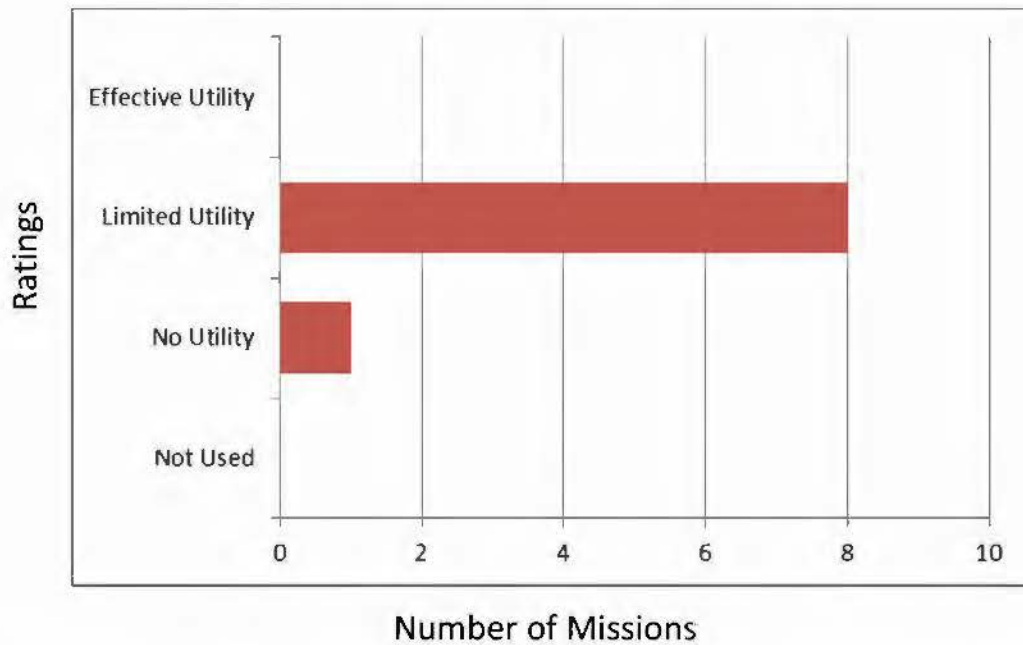
JBC-P demonstrated limited utility in contributing to the unit’s force effectiveness during missions of the JBC-P MOT&E. Following the completion of the MOT&E, DOT&E and the Army Test and Evaluation Command employed a panel of military subject matter experts to assess JBC-P’s force effectiveness during nine MOT&E missions. As shown in Figures 3-6 and 3-7, the DOT&E and panel assessed each mission against the following force effectiveness components.

- **Mission Success.** Mission success is an assessment of the unit’s ability to complete their mission while preserving combat power for future operations. Mission success was scored on a 5-point scale ranging from 1 as “failure” to 5 as “fully successful.”
- **Mission Utility.** Mission Utility is an assessment of JBC-P’s contributions to the unit accomplishing its task. Mission utility was scored on a 4-point scale ranging from 1 as “not used” to 4 as “effective utility.”



Scores ranged from 1 (Failure) to 5 (Fully Successful). The panel scored each of the 9 missions.

Figure 3-5. Blue Ribbon Panel Voting - Mission Success



Scores ranged from 1 (Not Used) to 4 (Effective Utility). The panel scored each of the 9 missions.

Figure 3-6. Blue Ribbon Panel Voting - Mission Success

Units using JBC-P accomplished their mission (three Marine missions and six Army missions) when employing JBC-P during MOT&E missions.

- **Mission Success.** Soldiers, Marines, and leaders accomplished their nine missions, which were assessed by the Blue Ribbon Panel with no more than 10 percent

casualties or loss of equipment. Mission success ranked as a 4.0 on a 5-point scale in 9 of 9 missions.

- **Mission Utility.** Primarily using chat, which is a legacy capability, JBC-P provided situational awareness to Soldiers and Marines and improved the unit's ability to accomplish its mission with limited utility in 8 of 9 missions (89 percent). JBC-P provided no utility to the unit's mission in 1 of 9 missions (11 percent). On average, JBC-P mission utility ranked as a 2.89 on a 4-point scale.

The following summary observations highlight JBC-P contribution to mission accomplishment:

- JBC-P provided timely situational awareness information (primarily through chat) to support combat operations.
- Soldiers, Marines, and leaders across the brigade and regiment used chat to enhance force effectiveness. Military experts on the force effectiveness panel assessed that the use of JBC-P improved situational awareness and reduced occurrences of fratricide.
- JBC-P chat served as the primary command and control backup to combat net radio voice communications across all brigade and regiment echelons.
- Leaders used JBC-P for planning routes and tracking unit movement, especially in conditions of low visibility.
- JBC-P allowed the marking of IEDs and other obstacles, which allowed follow-on forces to avoid these hazards.
- Management of JBC-P's enemy force situational awareness, to include removal of stale red icons and more frequent updates of enemy forces, needs improvement through development of tactics, techniques, and procedures; training; and system improvement.

Unit Task Reorganization

The test unit successfully conducted Unit Task Reorganizations (UTRs) with JBC-P. UTR with the JBC-P is exercised by the brigade commander or S-3, and executed by the S-6. When executed, the UTR function reconfigures the JBC-P network to support information transfer to realigned units, which enabled the brigade to be reorganized for combat. Operators reported that the UTR task was simple and intuitive.

In the MOT&E, there were 14 separate UTR actions that occurred during the record test. Of the 14 distinct UTRs, the unit changes or task reorganizations occurred at the platoon, company, battalion, and regiment echelons. These included intra- and inter-Service (i.e., Army to Army and Army to Marine Corps and vice versa) UTRs. The key UTRs were:

- 2-8 Marines into (and back out of) the 2-1 AD
- F Company, 2-8 Marines into (and back out of) 1-6 INF

- C Troop, 1-1 CAV into (and back out of) 4-17 INF
- D Company, 1-6 INF and A Troop, 1-1 CAB into (and back out of) 2-8 Marines

The unit was successful with all UTRs executed using JBC-P. As part of the UTR process, Self-Descriptive Situational Awareness (SDSA) information providing position location information and organizational structure is posted to the Data Dissemination Service for use by other users. Upon completing the UTR, the involved units are supposed to have visibility of their unit changes. During the MOT&E, the “as of times” within the SDSA were not accurate and were not consistent for about 10 percent of the UTR records, which provided misinformation to units and incorrect updates to the brigade’s Data Dissemination Service. This error did not affect the UTR or reduce the JBC-P functionality, and had negligible impact on the unit.

Hybrid Capability

The JBC-P Software Build 6.0 system provided a successful hybrid capability via NSG software loaded on each system. The capability allows the system to simultaneously send C2, Situational Awareness Visibility, Survivability, and Chat messages via satellite and terrestrial radios. In the case of a Blue Force Tracker 2 (BFT2) satellite failure, the platform will become a client of another local platform, which is configured as a gateway on the terrestrial network. JBC-P demonstrated this capability with 40 Army and Marine hybrid systems sending out 686,157 messages simultaneously via satellite BFT2 and the terrestrial network. Note however, that although dual-transmission occurred, message completion rates were often below requirements, and information transmitted was inaccurate.

Digital Maps and COMSEC Failures

The digital maps used by JBC-P Software Build 6.0 during the NIE 14.2 MOT&E and NIE 15.1 are not current. Soldiers zooming in or out of maps experienced slow processing, and at times the software locked up, which required up to 10 minutes to reboot the system. Soldiers reported that when they zoom in on a map, the display is a checkerboard mixture of imagery and maps. Map grid lines are not accurate, and at times were displayed offset between 800 to 1,500 meters. The program office reported that auto grid lines work fine, but the user selectable grid lines should not be used. The Army needs to fix JBC-P map software problems and not rely upon training (i.e., only use auto grid lines) as a solution.

The JBC-P system communications security (COMSEC) device, KGV-72, continued to drop COMSEC encryption key fills during NIE 15.1. When this happens, the Soldier’s JBC-P is not operational until he receives assistance from the unit’s communications maintenance specialist or contractor field service representatives. The delay awaiting qualified personnel to rekey the KGV-72 detracted from unit mission accomplishment. Training provided to Soldiers on the KGV-72 was not effective.

JBC-P Log

As an integral component of JBC-P Software Build 6.0, JBC-P Log did not support the Army brigade’s logistics mission. The Army intends JBC-P Log to interrogate RFID tags,

transfer the information into Army logistics systems, and allow Soldiers to track cargoes in a dynamic manner. Per operator consensus, Soldiers reported a 30 – 40 percent success rate in interrogating RFID tags for data entry into the logistics tracking system. Once interrogated and entered into the system, JBC-P Log allowed operators to input duplicate tags without removing the tag from its cargo mission. This deficiency caused duplicate cargoes in brigade transport vehicles, and the brigade lost visibility of its cargo assets because of JBC-P Log. Operators did not have the training or experience to correct the problem. Brigade field service representatives attempted to fix this problem by reimaging computer hard drives from 42 JBC-P Log systems during the weekend prior to record test. At the start of record test, 39 of 42 JBC-P Log systems were available to conduct missions. JBC-P Log was not returned to full mission capability until the second day of record test. Even with refresher training and reimaged hard drives, the unit continued to experience the JBC-P Log problems discussed above. The JBC-P Log system did not support the unit’s logistics mission and the Army does not have effective tactics, techniques, or procedures for the employment of JBC-P Log.

JBC-P Log supplies information to the larger Army logistics system to provide updates to the In-Transit Visibility (ITV) servers. Figure 3-7 shows the portion of the operational environment that was instrumented for the JBC-P Log systems during NIE 14.2. Once the Soldier was able to interrogate the RFID tag, JBC-P was able to transfer the data to the JBC-P NOC for transfer through the Movements Tracking System-Enhanced Software to the ITV servers. The 10 instrumented JBC-P Log platforms and 2 control stations sent a total of 1,388 RFID Tag Reports, Queries, and Searches across 94 unique tags to the JBC-P NOC. The JBC-P NOC received 98.1 percent of these messages. JBC-P Log maintains a satisfactory link to the NOC. Future testing should assess transfer of information to the destination ITV servers.

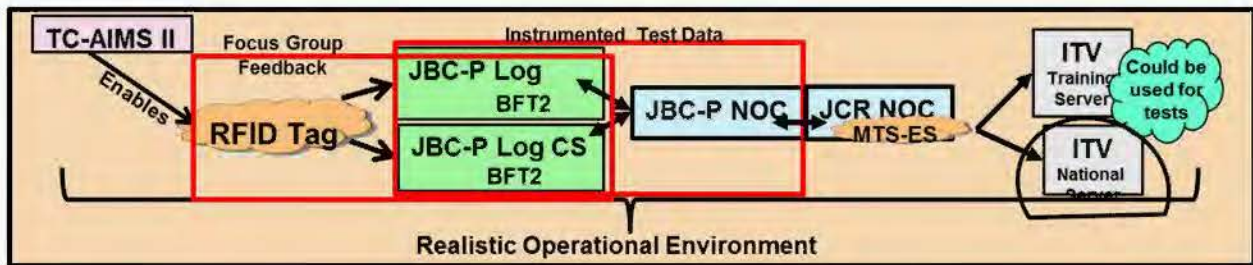


Figure 3-7. JBC-P Log Operational Environment

During NIE 15.1, JBC-P Log operators experienced problems communicating with the command elements of the brigade. The JBC-P Log is an unclassified system designed to support logistics operations, while JBC-P supports mission command in a classified network. JBC-P Log does not allow sustainment units (logistics and personnel) to participate in JBC-P chat sessions to discuss ongoing classified brigade operations. There are not enough JBC-P classified systems within sustainment units to satisfy the units’ need for coordination with the brigade’s combat formations.

Section Four Suitability

The Joint Battle Command – Platform (JBC-P) is not operationally suitable. JBC-P is not reliable for most versions of hardware hosting JBC-P Software Build 6.0. During the Multi-Service Operational Test and Evaluation (MOT&E), which occurred during Network Integration Evaluation (NIE) 14.2, DOT&E evaluated the reliability, availability, and maintainability of major JBC-P system configurations employed by Army and Marine Corps units:

- Joint Version 5 (JV5)
 - Block I Computer System
 - Block II Computer System
- Military Family of Computing Systems (MFoCS)
 - MFoCS-Basic (MFoCS-B)
 - MFoCS-Intermediate(MFOCS-I)
- Tactical Operations Center (TOC) Kit
 - Dell XFR TOC
 - MFoCS-B TOC
- JBC-P Logistics (JPC-P Log)
 - Military Rugged Tablet – Plus (MRT+)
 - MRT+ Control Station (MRT+ CS, TOC)

JBC-P experienced inconsistent reliability across the spectrum of the major JBC-P system configurations. Some configurations performed well, but most did not meet the Mean Time Between Essential Function Failure (MTBEFF) requirement of 290 hours. Fifty-eight percent of JBC-P Essential Function Failures were due to software. With the exception of the JBC-P Log MRT+, all mobile JBC-P systems met the user's 80 percent operational availability requirement. While the Marine Corps XFR TOC system met the requirement, the Army's use of the XFR in a TOC did not meet the operational availability requirement.

JBC-P met the 30-minute Mean Time To Repair (MTTR) maintainability requirement for all variants of the system. Soldiers and Marines were able to maintain the system because most failures were software-related and the crew could correct them by rebooting the system without maintenance support. The reboot process requires three steps: power down, power up, and log in. The average time for a JBC-P reboot, to include system spontaneous rebooting during MOT&E, was eight minutes.

JBC-P training prepared Soldiers and Marines to install and operate their mobile and TOC systems. The Army should consider improving the training to:

- Provide sufficient time for unit collective training.

- Increase hands-on instruction.
- Increase troubleshooting instruction for maintainers.
- Provide leaders with information tailored to their command or staff position.
- Provide technical manuals to Soldiers and Marines.

The JBC-P Log training provided to Soldiers by the Army was not effective. Even with retraining at the beginning of record test, training did not prepare them to operate or maintain JBC-P Log.

Reliability

JBC-P is not reliable. Table 4-1 shows the MTBEFF experienced during MOT&E for the six vehicle-mounted configurations and two TOC Kit configurations. On June 4, 2013, the Army approved lowering the JBC-P MTBEFF requirement from 470 hours to 290 hours. The Marine Corps concurred with this lowered threshold requirement. The Operational Availability requirement remained unchanged at 0.90.

Table 4-1. Demonstrated MTBEFF in the MOT&E

	Operating Hours (# of Systems)	Essential Function Failures	MTBEFF Point Estimate (hours)	MTBEFF 80% Confidence Bounds (hours)		MTBEFF Requirement (hours)
				2-Sided	Lower	
Army Systems						
JV5 Block 1	1,405 (10)	1	1,405	361-1,336	469	290
JV5 Block 2	1,441 (12)	0	---	---	895	290
MFoCS-B	2,865 (20)	0	---	---	1780	290
MFoCS-I	2,695 (20)	12	225	152-344	170	290
MFoCS-B TOC	506 (3)	3	169	76-459	92	None
XFR TOC	380 (2)	1	380	98-3,607	127	None
MRT+	449 (10)	5	90	48-185	57	None
MRT-CS	224 (2)	1	224	58-2,126	75	None
Marine Corps Systems						
JV5 Block 1	954 (7)	3	318	143-866	173	290
XFR TOC	156 (1)	0	---	Not Demonstrated		None
--- = Undefined. Cannot divide by 0						

Since all vehicle-mounted and TOC JBC-P variants must support Soldiers/Marines within the same mission, all system variants are assessed against the user's requirement of 290 hours MTBEFF. Both of the JV5 configurations (Block 1 and Block 2) met or exceeded the requirement. The Army's data for the MFoCS-B mounted configuration yielded a very high

reliability estimate (80 percent lower confidence bound = 1,780 hours), but the MFOCS-B performance was not consistent with the same hardware in the TOC configuration that demonstrated an MTBEFF of 92 hours (80 percent lower confidence bound). The MFOCS-I mounted configuration experienced poor reliability, with an 80 percent lower confidence bound of 170 hours. The remaining five JBC-P configurations did not meet the user’s reliability requirement.

Table 4-2. Demonstrated Mission Reliability and Platoon Reliability

	Operating Hours (# of Systems)	Mission Reliability Point Estimate	Mission Reliability 80% Lower Confidence Bound	Probability of Platoon (3/4) Completing a Mission
Army Systems				
JV5 Block 1	1,405 (10)	0.99	0.86	1.00
JV5 Block 2	1,441 (12)	----	0.92	1.00
MFOCS-B	2,865 (20)	----	0.96	0.96
MFOCS-I	2,695 (20)	0.81	0.74	0.99
MFOCS-B TOC	506 (3)	0.65	0.46	N/A
XFR TOC	380 (2)	0.83	0.57	N/A
MRT+	449 (10)	0.45	0.28	N/A
MRT-CS	224 (2)	0.73	0.38	N/A
Marine Corps Systems				
JV5 Block 1	954 (7)	0.80	0.66	0.95
XFR TOC	156 (1)	----	----	N/A
--- = Undefined. Cannot divide by 0				

The majority of JBC-P variants did not achieve (with confidence) the required Mission Reliability of 80 percent probability of completing a 72-hour mission without an Essential Function Failure at the 80 percent lower confidence bound (Table 4-2). The table presents both the mission reliability of a single system and the reliability of three out of four vehicles in a platoon completing a mission, as described in the user’s requirement. The MFOCS-B (mounted) Mission Reliability demonstrated reliability well above the MFOCS-B in the TOCs and the MFOCS-I in mounted configuration. These results present inconsistent and statistically different results for the MFOCS hardware configurations. The Army should conduct further investigation into the reduced mission reliability of the MFOCS-B operated within TOCs compared to the MFOCS-B operated within vehicles. The Marine Corps XFR TOC system did not accumulate sufficient operating hours to produce a statistically valid estimate. Because the TOCs (MFOCS-B TOC and XFR TOC) and the JBC-P Log (MRT+ and MRT-CS) systems do not operate in a combat platoon configuration, the user’s three out of four vehicles mission reliability standard does not apply.

The majority of JBC-P failures in MOT&E were due to software. The following descriptions provide failure categories and frequency of repeated failures during the JBC-P Software Build 6.0 MOT&E. Table 4-3 provides a further breakdown of these major failure modes.

- **System Stall (11 Failures)**. JBC-P stopped responding to operator input. The system would return to operator control or require a system reboot. The system exhibited symptoms of the software and hardware being overtasked.
- **Cryptographic Recognition (9 Failures)**. The JBC-P lost use of its component Programmable In-Line Encryption Device, KGV-72. When loss of the associated cryptographic key occurred, unit maintainers had to zero (erase) the KGV-72 key, reload the current key, and reboot the JBC-P system. Since the operator did not have the key, the Unit Maintainer (Military Occupational Specialty 25U, Signal Support Specialist) performed this action.
- **Defense Advanced Global Positioning System (GPS) Receiver (DAGR) Problems (5 Failures)**. JBC-P lost contact with the GPS information provided by its component DAGR.

Table 4-3. Breakdown of Repeated Failure Modes during the JBC-P MOT&E

General Failure Mode Description	Number of Failures	Failure new in MOT&E?	Comments
System Stall			
Spontaneous Reboot	7	No	A symptom of multiple failures that could not be isolated from test data. Issue sometimes caused by the system self-rebooting when internal diagnostics indicated poor system health. The average reboot time is 8 minutes. The system returned with the log-on screen; however, any unsaved data or products are lost.
Frozen Display	1	No	Display does not respond to operator inputs. Operator must reboot system to recover.
Spontaneous Shutdown	1	No	JBC-P spontaneously turns itself off. Crew must restart system. All open and unsaved files or products are lost.
Hard Disk Corrupt	1	No	Replace hard disk.
Cryptographic Recognition			
Amber-Green	2	No	When KGV-72 status LED shows amber green, JBC-P has lost synchronization with its component KGV-72. The operator had to zero the KGV-72 crypto keys, reload crypto keys, and reboot the system.
KGV-72 Red	2	No	When KGV-72 status LED shows red, cryptologic functions are suspended. This may be caused by any number of internal or external events that the cryptologic device interprets as a hazard to secure data. This results in loss of all communications. The crew could, in most cases, recover with a reboot of the system.
KGV-72 Amber-Green	2	No	Synchronization between JBC-P hardware and KGV-72 is lost. The operator had to zero the KGV-72 crypto keys, reload crypto keys, and reboot the system.
KGV-72 Down	2	No	A catch-all for failures that render the KGV-72 inoperable but are not represented above. JBC-P provides no user support if the KGV-72 is down.
KGV-72 Flashing Green	1	No	When the KGV-72 status LED shows flashing green, this indicates a specific KGV-72 failure mode that requires a crypto key refill.
Defense Advanced GPS Receiver (DAGR) Problems			
GPS Down	4	No	DAGR lost GPS connection. Typically resolved with a DAGR reboot. JBC-P cannot provide user location until this problem is resolved.
GPS Cable Failure	1	No	Replace cable
MRT			
RFID Inoperable	1	Yes	Reboot System
Tablet Failure	1	Yes	Replace Tablet
Messaging Issues			
Message Failure	5	No	Reboot System
Overlay Failure	1	No	Self-correcting
Graphics Issue	1	Yes	System freezes when zooming between different scale maps. Rebooting system resolves the problem.
Attachment Failure	1	No	Unknown Failure Mode

A review of the brigade Trouble Ticket Log (Table 4-4) revealed the following system failures and the number of failures that required Field Service Representative (FSR) Support. Although the emphasis for the MOT&E is Record Test, the table also provides the quantity of trouble tickets reported within the brigade during the Pilot Test.

Table 4-4. NIE 14.2 Trouble Tickets Summary

Test Phase	Types of Repair	2-1 Brigade	2-8 Marines	4-17 Infantry	1-1 Cavalry	47 Brigade Support Battalion	Total	FSR Support Required
Pilot	Software			2	3	2	7	5
	Hardware		4	2	10	1	17	17
Record	Software	3	1		1	5	10	5
	Hardware	1	2	4	10	13	30	15

Key Deficiencies requiring FSR support:
 KGV-72 – Rekeying , Replaced
 Reconfigure JBC-P Hard drives
 Cables – repair/replace
 Transceiver – replace/change to correct data group or network
 TIGR- connectivity with JBC-P and operations

Figure 4-1 shows the distribution of the failures by category. As assessed by the JBC-P, DOT&E, and MOT&E Reliability Availability Maintainability Scoring Conference, 58 percent of JBC-P failures were due to software and 23 percent of failures were due to hardware.

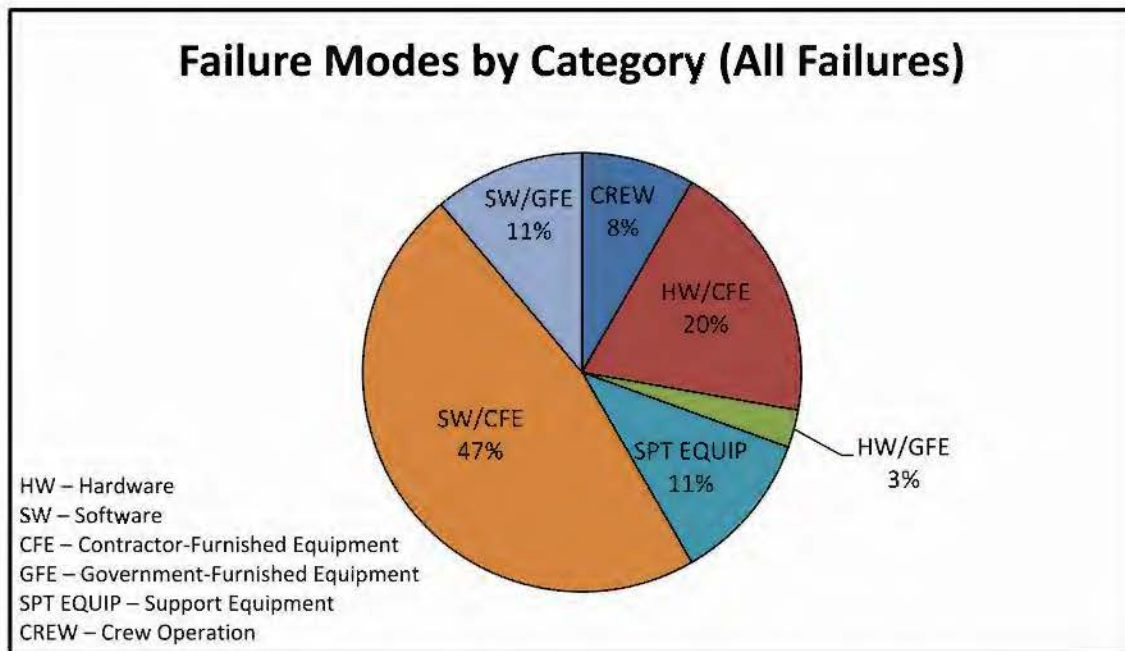


Figure 4-1. Failure Modes by Category during the JBC-P MOT&E

Availability

Table 4-5 shows the Operational Availability (A_o) derived from the recorded operating hours and associated downtime hours during the MOT&E. All mobile platforms met the 80 percent operational availability requirement except the JBC-P Log MRT+. The Army's use of the XFR in a TOC (0.684) did not meet the 80 percent operational availability requirement. These results are not consistent with the Marine Corps' use of the XFR in their TOC, which exceeded (1.00) the requirement.

Table 4-5. Operational Availability (A_o) Estimates for Hardware Configurations

A_o from Record Test (Requirement 0.80)			
Configuration	Operating Hours	Down Time (hours)	A_o
Army Systems			
JV5 Block 1 (Mobile)	1,405.0	0.4	1.000
JV5 Block 2 (Mobile)	1,441.2	0.0	1.000
MFoCS-B (Mobile)	2,864.9	287.2	0.909
MFoCS-I (Mobile)	2,694.9	463.9	0.853
MFoCS-B (TOC)	505.9	4.8	0.991
XFR (TOC)	380.3	176.0	0.684
MRT+ (Mobile)	448.7	358.8	0.556
MRT+ CS (TOC)	224.0	41.0	0.845
Marine Corps Systems			
JV5 Block 1 (Mobile)	953.5	100.3	0.905
XFR (TOC)	156.0	0.0	1.000

Maintainability

JBC-P is maintainable and met its ≤ 0.50 -hour Mean Time To Repair (MTTR) user requirement, demonstrating an MTTR of 0.43 hours (26 minutes) (Table 4-6). The majority of maintenance events were related to software failures, and the unit could correct most of these through user or organic maintenance. Soldiers with Military Occupational Specialty 25U (signal support specialist) accomplished most organizational maintenance.

Table 4-6. Mean Time To Repair (MTTR) for all JBC-P Platforms

NIE 14.2 MOT&E MTTR (Requirement ≤ 0.50 hrs)			
Level of Maintenance	Maintenance Time (hrs)	Number of Events	MTTR
Crew	6.00	34	0.18
Organization	4.10	9	0.46
Unit (Crew + Organization)	10.25	36	0.28
FSR	5.17	6	0.86
TOTAL	15.42	36	0.43

FSRs were necessary for 6 of the 36 maintenance actions (17 percent) listed in Table 4-6. Seventeen percent is high for FSR support, but it is consistent with previous testing, with the exception of the JBC-P IOT&E at NIE 13.2. At the IOT&E, JBC-P experienced a high number of KGV-72 failures that were resolved by unit maintenance actions, which suppressed the FSR support percentages. The high percentage of FSR support during MOT&E is consistent with Soldier/Marine comments that they need more maintenance training to reduce reliance on FSRs.

Training

The Army did not provide sufficient collective training (unit-level, hands-on training) for Soldiers and Marines to gain proficiency on the JBC-P system. Soldiers and Marines received New Equipment Training (NET), but following NET and JBC-P installation, units did not have sufficient time to conduct collective training, which is necessary to reinforce JBC-P individual skills and integrate the system into brigade mission command operations. The absence of collective training reduced the units' ability to employ the full capabilities of the JBC-P system. Leaders estimated that they would need at least a month of collective training for the unit to become proficient with JBC-P operating within brigade operations. The JBC-P MOT&E highlighted the following observations:

- Additional MOS 25U Soldiers are needed at the unit level to support the numerous communications and mission command systems being fielded within the Army.
- Individual training provided the knowledge and skills to enable new users to operate and maintain JBC-P.
- Due to the novice level of training, the NET operators' course did not provide substantial benefit for experienced Soldiers with previous knowledge of Force XXI Battle Command Brigade and Below (FBCB2), Joint Capability Release (JCR), or JBC-P gained from participation in previous NIEs or experience from previous units.
- Soldiers requested that the NET operator's course include troubleshooting and hands-on training, and that maintainers receive more in-depth technical maintenance training in the maintainers' course.
- Soldiers and Marines requested a leaders' NET that would focus on the capabilities provided by JBC-P. This course would train the use of JBC-P by job position, with

focus on Platoon Leader, Platoon Sergeant, Company Commander, TOC Staff Officer, and other key staff positions.

- The Army should provide the 2-1 Brigade and all fielded units with a Digital Standard Operating Procedure (SOP) to define the complex setup of the JBC-P within the brigade's complex mission command network. This SOP should include the tactics, techniques, and procedures for employing JBC-P.
- The unit received a limited number of technical manuals for operators. Units were supposed to receive technical manuals, but many reported that they did not have them. Operators had the NET compact discs (CD), but in the field, there was no place to use a CD. The JBC-P system maintained digital technical manuals on its hard drive, but if the system failed, this resource is not available.
- JBC-P Log training provided to Soldiers was not effective. Operators required retraining by FSRs at the beginning of Record Test. The training provided did not prepare the Soldiers to operate or maintain JBC-P Log at the individual or unit level.

Interoperability

The JBC-P Software Build 6.0 MOT&E demonstrated joint interoperability of JBC-P between the Army and Marines. Soldiers and Marines executed JBC-P functions to include C2 messaging, Situational Awareness, Survivability, and Chat across Army and Marine units. The Army and Marines demonstrated JBC-P's ability to reconfigure units through Unit Task Reorganizations (UTRs) across and within services.

There were a total of 282 JBC-P systems and many earlier versions of FBCB2 (i.e., FBCB2 Version 6.5 and JCR) participating in the MOT&E to support the Army and Marine units. JBC-P demonstrated both interoperability and backwards compatibility. The Army instrumented both Army and Marine JBC-P and FBCB2 systems to collect data. Data collectors embedded within the units collected manual data and observations on both systems.

Logistics Supportability

The Army demonstrated the JBC-P logistics supportability plan in a logistics demonstration event concurrent with the JBC-P MOT&E. Brigade Soldiers performed a total of 350 maintenance tasks during the logistics demonstration and validated 8 technical manuals. The Marines conducted their own organic logistics and maintenance support within the battalion, employing the support of their four MOS 2800, Data/Communications Maintenance Specialists and the brigade FSR assigned to their battalion.

The Life Cycle Support Plan (LCSP) outlines operator-level basic preventive maintenance checks and services and basic troubleshooting in accordance with the operator technical manual. The LCSP details the field-level (organization's signal support specialist - MOS 25U) maintenance tasks consisting of troubleshooting hardware, software, and the network. The signal support specialist tasks include removing and replacing line replaceable units, hard drive, and faulty KGV-72 devices. All maintenance actions above the field level

signal support specialist are performed by a contractor FSR controlled by the Brigade Support Battalion.

The Army executed the LCSP during the JBC-P MOT&E. Operators (vehicle and TOCs) and unit maintainers were able to troubleshoot JBC-P system faults and return the system to operation 83 percent of the time, with the FSRs being called in for 17 percent of system failures. The Soldier and Marine maintainers and operators stated that it was easy to conduct preventive maintenance checks and services. Maintainers and operators were hindered in repairing JBC-P due to lack of spares such as cables, batteries, and fuses. Unit maintainers completed the NET Field Level Maintainers Course and rated the course as effective in providing the Soldiers and Marines with sufficient knowledge to complete their maintenance tasks. The operators noted that the operator's NET should contain more troubleshooting and maintenance at their level. At the operator level, maintenance consists of rebooting the system. The logistics company in the Brigade Support Battalion is not authorized a signal support specialist (as allocated to maneuver companies), which hampers the maintenance of the JBC-P Log systems within the unit. To support their JBC-P Log systems, the logistics company cross-trained a unit fuel handler to perform the signal support specialist job. This provided support for JBC-P Log, but removed the Soldier from performing his assigned mission within the unit.

Section Five Recommendations

The Army and Marine Corps should consider the following actions to improve Joint Battle Command-Platform (JBC-P) Software Build 6.0:

- **Improve Effectiveness.** The Army should improve JBC-P support to unit mission accomplishment.
 - Fix position location identification icon deficiencies to include false location, lagging, and racing icons.
 - Correct unit command and control alerting, i.e. eliminate phantom Mayday messages.
 - Improve shared survivability information to enable better retrieval and/or caching of relevant Entity Data Message map icons.
 - Fix map deficiencies to include zoom and grid line accuracy problems.
 - Improve the performance of the communications security device, KGV-72.
 - Improve noted JBC-P Log deficiencies.
 - Demonstrate improvements in a future operational test.
- **Improve Reliability.** The Army should improve JBC-P's reliability.
 - Identify and fix failure modes for the MRT+ and inconsistent reliability performance for the MFoCS configurations.
 - Demonstrate improved reliability in an operational test prior to full materiel release and subsequent fielding of the JBC-P Software Build 6.0.
- **Improve Training.** The Army should improve JBC-P New Equipment Training.
 - Provide JBC-P collective training that validates both individual and unit proficiency. Expand collective training to include JBC-P Log.
 - Expand the leader's course to provide more JBC-P information tailored to the individual command/staff position to allow the full use of its mission command capabilities.
 - Expand the operator's course to include more hands-on training and provide more detail on trouble shooting beyond doing a system "reboot."
 - Include training on all JBC-P components, e.g. KGV-72 encryption device, to enable Soldiers to install, operate, and maintain the system.
- **Create a Digital Standard Operating Procedure (SOP).** The Army and Marine Corps should create a digital SOP to integrate the numerous mission command systems with their services. This document should standardize mission command operations for both tactical operational centers and on-the-move systems.

- **Increase Signal Soldier Manning.** The Army should evaluate manning of Signal Soldiers, e.g. Military Occupational Specialty 25U, across the brigade to support JBC-P and other networked systems. The Army should conduct a holistic assessment of mission command systems with accompanying communications systems and staff their units for mission success.
- **Improve Survivability.** The Army should address the deficiencies and recommendations noted in the classified annex of this report.