AN/VRC 118 Mid-Tier Networking Vehicular Radio and Joint Enterprise Network Manager Early Fielding Report

This report provides my assessment of the AN/VRC-118 Mid-Tier Networking Vehicular Radio (MNVR) and the Joint Enterprise Network Manager (JENM) in support of the Army's fielding of low-rate initial production (LRIP) MNVRs to the 1st Brigade, 82nd Airborne Division in January 2017. The testing to support this assessment was:

- Mid-Tier Network and MNVR Operational Assessment, April through May 2016. During Network Integration Evaluation (NIE) 16.2, the Army's Brigade Modernization Command (BMC) assessed the concept of operations and basis of issue of a brigade's MNVR network operating in a satellite communications (SATCOM)-denied environment. The Army's assessment was directed by the Vice Chief of Staff and did not require a Director, Operational Test and Evaluation (DOT&E)-approved test plan. DOT&E did observe the entire assessment. In July 2016, DOT&E published an independent evaluation of the Army's MNVR Operational Assessment in support of a September 2016 Milestone C decision review.
- MNVR Limited User Test (LUT), April through May 2015. During NIE 15.2, the Army conducted a MNVR LUT at Fort Bliss, Texas, in accordance with a DOT&E-approved test plan. In November 2015, DOT&E published a MNVR LUT report to support the MNVR Milestone C decision review.

As a result of the September MNVR Milestone C decision review, the Under Secretary of Defense for Acquisition, Technology and Logistics issued an Acquisition Decision Memorandum (ADM) in September 2016 that authorized the Army to procure an additional LRIP procurement of 478 MNVRs to "meet near term needs and provide the opportunity for additional testing and experience." The September 2016 ADM does not address the JENM, which must be fielded with MNVR to allow soldiers to configure and manage the software-defined radio network. These 478 radios are in addition to the Army's September 2013 initial LRIP authorization of 232 MNVRs procured for use as test assets.

The Army's BMC MNVR Operational Assessment determined the MNVR does not meet the Army's needs for a mid-tier network. The Army is updating the MNVR Capabilities Production Document and will perform a new competitive source selection during fiscal years 2018-2019 (FY18-19) to meet the revised requirements. The Army intends to conduct the MNVR Initial Operational Test and Evaluation (IOT&E) with the new radio in FY21 to support a fielding decision. The results of this acquisition effort may result in a different radio and waveform to meet the Army's modified mid-tier network requirements. In the interim, the Army is fielding the LRIP MNVRs with accompanying JENMs to four Infantry Brigade Combat Teams during FY17-18.

Operational Effectiveness

The MNVR is not operationally effective. During the MNVR Operational Assessment and MNVR LUT, DOT&E assessed several performance shortfalls summarized below and

detailed in the attached reports. Based on the MNVR Operational Assessment, DOT&E and BMC reported that all 39 surveyed company and battalion commanders and senior staff recommended that the Army not field MNVR. Survey results demonstrated MNVR did not mitigate the significant impacts to communications and mission execution experienced in a SATCOM-denied environment.

Range

The MNVR's Wideband Networking Waveform (WNW) does not provide sufficient transmission range for the units to establish and maintain a mid-tier terrestrial network within their area of operations. During the MNVR Operational Assessment, brigade and battalion signal staffs developed communications plans that constrained the units' scheme of maneuver to compensate for the limited transmission range of MNVR. Five of six battalion commanders stated that they require a 16 kilometer transmission range instead of the 6 to 10 kilometers provided by the MNVR to support their operational requirements. During the MNVR LUT, the 1st Battalion, 6th Infantry MNVR network demonstrated low WNW connectivity. On average, 40 percent of the battalion radios had a connection back to the battalion headquarters. Under SATCOM-denied conditions, the battalion would not have maintained a mid-tier data network to connect the battalion headquarters with its subordinate companies.

The Army designed the mid-tier network to mitigate MNVR transmission range limitations by enabling additional radios in the formations to route and retransmit data. During the 2016 MNVR Operational Assessment, increasing the number of MNVRs did not improve the commander's ability to conduct mission command over the MNVR WNW mid-tier network.

Network Usage

During the 2016 MNVR Operational Assessment, commanders did not need the high bandwidth provided by the MNVR WNW mid-tier network. Commanders within the areas supported by the mid-tier network relied upon voice, chat, and position location information to conduct combat operations. During the MNVR LUT, the mid-tier network carried little data traffic and did not stress the WNW mid-tier network. The primary mission command system that uses the mid-tier network is the Joint Battle Command – Platform (JBC-P), which exchanges small data files to support chat and Joint Variable Message Format messages (e.g. position location, free text, and situation reports).

Latency

The MNVR does not have a requirement for speed of service (latency). During the MNVR LUT, the MNVR WNW mid-tier network did not support JBC-P speed of service requirements. The mid-tier network must support low latency requirements of time sensitive mission command applications to support the unit's situational awareness of battlefield hazards such as placement of improvised explosive devices and enemy formations.

Distribution of Combat Power

The employment of the Army's mid-tier network requires MNVR retransmission vehicles. The use of retransmission vehicles requires the battalion to provide security, which

reduces the unit's available combat power. During the 2015 MNVR LUT, the 1st Battalion, 6th Infantry diverted up to 10 percent of its combat power to provide security for the mid-tier network retransmission vehicles. The limited transmission range of the MNVR WNW introduces a requirement for retransmission vehicles that exceeds those of legacy networks, and reduces the unit's available combat power in providing security for those assets.

Network Management

Contract Field Service Representatives (FSRs) used the JENM to plan, configure, and load MNVRs prior to the MNVR LUT. During the LUT, soldiers were not able to use the JENM to monitor or manage the WNW links between the MNVRs. The JENM monitoring function provided rudimentary information as to whether a link existed and did not provide an ability to manage radios. The Army has updated the JENM since the MNVR LUT to add increased capabilities to support the soldier's ability to monitor and maintain the WNW network. These enhancements have not been tested in an operational test. During the Army Warfighter Assessment 17, soldiers used the latest version of the JENM (with some FSR assistance) to configure the MNVR to support a mid-tier network. The Army demonstrated JENM monitoring and management of WNW networks during a laboratory event using a simulated WNW network and conducted a formal developmental test of these features in first quarter, FY17. The Army is assessing the results of this test.

The Army has not demonstrated that soldiers can design, plan, and configure a full brigade complement of MNVRs without the help of FSRs. In all cases, FSRs assisted with the configuration of MNVRs to create the mid-tier network. DOT&E cannot provide a full assessment of JENM capabilities due to the lack of a soldier-led, end-to-end test event.

Operational Suitability

Based upon the 2015 MNVR LUT, the MNVR is operationally suitable. Nonetheless, during developmental test leading to the LUT, the MNVR did not meet its reliability requirement in a loaded network simulating full brigade usage. Based on the results of developmental test, the Army made improvements to the MNVR and the radio's integration into the larger network prior to the 2015 LUT.

The MNVR is larger and uses more vehicle power than legacy vehicular radio systems. MNVR's increased power consumption requires continuous idling of host vehicles, which uses additional fuel and increases wear and tear on the engine.

Survivability

MNVR is not survivable due to cybersecurity vulnerabilities that could hamper the unit's ability to perform its mission. As is common to networking radios, MNVR is more susceptible to enemy electronic warfare support measures. Survivability is discussed in the classified annex of the 2015 MNVR LUT report. The Army has not completed any additional survivability testing.

Recommendations

The Army should consider the following recommendations for the MNVR and JENM:

- Develop a mid-tier concept of operations that employs the MNVR and associated waveforms to support leaders' and soldiers' use of mission command systems.
- Select a MNVR radio that will reduce bandwidth requirements and increase transmission range as described by commanders during the MNVR Operational Assessment.
- Develop a waveform with reduced susceptibility to electronic surveillance and direction finding.
- Select a MNVR that meets the size, weight, and power requirements of Army tactical vehicles.
- Address the cybersecurity vulnerabilities outlined in the classified annex of the 2015 MNVR LUT report.
- Plan, resource, and conduct an IOT&E of any new MNVRs resulting from the planned competitive source selection to support a future fielding decision.
- Conduct an IOT&E of the JENM in conjunction with the MNVR that assesses the full capability of JENM to support soldiers in the end-to-end network management process of planning, configuring, monitoring, and managing the mid-tier MNVR network and other software-defined radios within a brigade.
- Update the MNVR Test and Evaluation Master Plan (TEMP) to reflect the changes in acquisition strategy and planned future testing.
- Complete development and gain approval of the JENM TEMP.