Mid-Tier Networking Vehicle Radio (MNVR)

Executive Summary
- From April through May 2015, the Army conducted a Mid-Tier Networking Vehicle Radio (MNVR) Limited User Test (LUT) as part of the Network Integration Evaluation (NIE) 15.2 at Fort Bliss, Texas, in accordance with a DOT&E-approved test plan.
- DOT&E's evaluation based on the 2015 MNVR LUT is:
  - MNVR enhanced the unit's mid-tier network when operating within a full network, i.e. satellite communications were available.
  - In a reduced satellite network environment, the demonstrated MNVR Wideband Networking Waveform (WNW) network message completion rate was less than 76 percent, which does not meet the Army's MNVR requirement of 90 percent at-the-halt and 85 percent on-the-move.
  - The MNVR WNW network experienced faults that prevented 4 of 12 battalion MNVRs from sending or receiving any data for extended time periods (up to 36 hours).
  - The unit deployed security for MNVR retransmission vehicles (necessary to provide network area coverage). This security requirement reduced the unit's combat power by up to 10 percent.
  - Contractors using the Joint Enterprise Network Manager (JENM) were able to plan, configure, and load MNVRs prior to the MNVR LUT. Soldiers must perform this task in combat and during the MNVR IOT&E).
  - Using JENM, Soldiers could not monitor or manage MNVR networks.
  - The MNVR exceeded its reliability requirements.
  - MNVR was easy to use, but the integration of the radio into tactical vehicles and tactical operation centers (TOCs) requires improvement.
  - MNVR has cybersecurity vulnerabilities that could degrade the unit's ability to accomplish its mission.
- The Army is developing a Test and Evaluation Master Plan (TEMP) to support a January 2016 Milestone C decision to describe post-Milestone C developmental testing and an IOT&E.

System
- The Army's AN/VRC-118 MNVR program evolved from the terminated Joint Tactical Radio System, Ground Mobile Radio to provide software-programmable digital radios to support Army tactical communications requirements from company through brigade.
- The Army intends the MNVR to:
  - Operate at various transmission frequencies using the Soldier Radio Waveform (SRW) and the WNW.

  - Bridge the upper tactical communications networks at brigade and battalion with the lower tactical networks at company employing a terrestrial radio network.
  - Provide an alternative terrestrial transmission path in the absence or limited availability of satellite communications.
- The MNVR operates up to 75 watts maximum power output for WNW and up to 5 watts maximum power output for SRW.
- The JENM provides the means to plan, load, configure, and monitor MNVR networks.
- The MNVR includes both vehicle-mounted and TOC kit versions.
- The MNVR is a non-developmental item selected through multi-vendor competition.

Mission
- Army commanders intend to use the MNVR to:
  - Provide networked communications for host vehicles and TOCs during all aspects of military operations
  - Communicate and create terrestrial radio networks to exchange voice, video, and data using the SRW and the WNW.
  - Share data between different tactical communication networks and mission command systems
- Signal staffs intend to use the JENM to plan, load, monitor, control, and report on network operations of MNVR networks running SRW and WNW.

Major Contractor
Harris Corporation, Tactical Communications – Rochester, New York

Activity

- In November 2014, the Army conducted the Government Integration Test (GIT) at the Electronic Proving Ground in Fort Huachuca, Arizona. The GIT was the first MNVR developmental test and served to test the radio against its requirements. The purpose of GIT was to provide confidence that the MNVR was ready to proceed to the planned LUT. During GIT, MNVR:
  - Demonstrated WNW data and SRW voice and data requirements.
  - Did not meet message completion rate requirements over expected transmission distances of 6 – 10 kilometers.
  - Did not meet reliability requirements. Due to a large number of software faults, MNVR demonstrated less than half of its 477 Mean Time Between Essential Function Failure reliability requirement.
  - Did not interoperate with JENM to receive radio configuration files.
  - Did not employ WNW Anti Jam or SRW Electronic Warfare modes during test.
- In January and February 2015, the Army conducted the Government Regression Test (GRT) at the Electronic Proving Ground in Fort Huachuca, Arizona. The GRT tested capabilities that were not met or were not tested during the GIT, including the JENM, which was not available during the GIT. During GRT, MNVR:
  - Demonstrated the transfer of data files between mission command systems.
  - Routed SRW voice communications over multiple networks.
  - Established a gateway to the Warfighter Information Network – Tactical (WIN-T) Net Centric Waveform satellite network.
  - Interoperated with JENM to load MNVR radio configuration files.
  - Did not employ WNW Anti Jam or SRW Electronic Warfare modes during test.
- In April through May 2015, the Army conducted a MNVR LUT as part of the NIE 15.2 at Fort Bliss, Texas, in accordance with a DOT&E-approved test plan. During the LUT, the Army employed elements of the 2nd Brigade, 1st Armored Division consisting of a combined arms battalion, a field artillery battalion, and a brigade headquarters conducting missions under operationally realistic conditions. Testing assessed the operational employment of the MNVR providing a terrestrial communication pathway for the Joint Battle Command – Platform (JBC-P) and the WIN-T mission command systems, and the system's ability to establish a mid-tier network to link the lower tactical internet with the upper tactical internet.
- The Army is developing a TEMP to support a January 2016 Milestone C decision to describe post-Milestone C developmental testing and an IOT&E.

Assessment

- DOT&E's evaluation based on the 2015 MNVR LUT is:
  - MNVR enhanced the unit's mid-tier network when operating within a full network, i.e. satellite communications were available.
  - In a reduced satellite network environment, the demonstrated MNVR WNW network message completion rate was less than 76 percent, which does not meet the Army's MNVR requirement of 90 percent at-the-halt and 85 percent on-the-move.
  - The MNVR WNW network experienced faults that prevented 4 of 12 battalion MNVRs from sending or receiving any data for extended time periods (up to 36 hours). These MNVRs were within line-of-sight of other MNVRs and should have had communications. Existing test data do not identify whether the problem was due to the radio, WNW, or network configuration.
  - The unit deployed security for MNVR retransmission vehicles (necessary to provide network area coverage). This security requirement reduced the unit's combat power by up to 10 percent.
  - The unit's employment of the mid-tier network carried little data traffic and did not stress the bandwidth capacity of WNW.
  - Contractors using the JENM were able to plan, configure, and load MNVRs prior to the MNVR LUT. Soldiers must perform this task in combat and during the MNVR IOT&E.
  - Using JENM, Soldiers could not monitor or manage MNVR networks, and were not able to characterize the health of individual MNVR nodes or individual WNW links.
  - The MNVR exceeded its reliability requirements within the low network demands of NIE 15.2.
  - The MNVR was easy to use, but the integration of the MNVR into tactical vehicles and TOCs did not support Soldier ease of access during mission operations.
  - MNVR has cybersecurity vulnerabilities that could degrade the unit's ability to accomplish its mission.
- The Army still needs to conduct a complete IOT&E to test all features of MNVR and JENM within an operationally representative unit.

Recommendations

- Status of Previous Recommendations. This is the first annual report for this program.
- FY15 Recommendations. The Army should:
  1. Continue development of the MNVR to correct the deficiencies found during the MNVR LUT.
  2. Develop a Milestone C TEMP that addresses the developmental and operational testing that will support a Full-Rate Production decision.
  3. Plan and conduct an MNVR IOT&E using an Infantry Brigade Combat Team equipped with JBC-P, WIN-T Increment 2, and MNVR in accordance with an approved MNVR basis of issue plan.