OFFICE OF THE SECRETARY OF DEFENSE
1700 DEFENSE PENTAGON
WASHINGTON, DC 20301-1700

OPERATIONAL TEST
AND EVALUATION

JUL 20 2012

MEMORANDUM FOR UNDER SECRETARY OF DEFENSE FOR ACQUISITION, TECHNOLOGY AND LOGISTICS

SUBJECT: DOT&E Operational Assessment of the Joint Tactical Radio System (JTRS) Handheld, Manpack, Small Form Fit (HMS) Manpack radio and Joint Enterprise Network Manager (JENM)

This memorandum, which does not satisfy the requirements of Title 10 USC 2399, provides a synopsis of my operational assessment of the JTRS HMS Manpack and JENM. It is based on the results of the Manpack radio Multi-Service Operational Test and Evaluation (MOT&E) and JENM Initial Operational Test and Evaluation (IOT&E) conducted in April-May 2012 at White Sands Missile Range, New Mexico, and Fort Bliss, Texas. The Army conducted these operational test events in conjunction with the Network Integration Evaluation 12.2.

Operational Effectiveness

JTRS HMS Manpack

JTRS HMS Manpack radio is not operationally effective. This assessment is based upon the radio's poor performance when running the Single Channel Ground and Airborne Radio System (SINCGARS) waveform. As tested, Manpack radio SINCGARS range and voice quality were poor. The Manpack radio demonstrated a transmission range of 4 kilometers in the dismounted mode with an internal 20-watt power amplifier. In the vehicular mounted mode with 50-watt power amplifier, the Manpack radio demonstrated a maximum range of 7 kilometers. These ranges are less than half the range achieved by legacy SINCGARS radios. For example, during the MOT&E, mounted legacy SINCGARS radios were achieving typical ranges of 20 kilometers. SINCGARS voice quality was often poor, garbled, and unintelligible.

SINCGARS is a critical operational waveform that hosts battalion voice command and fires networks. The test company was not able to consistently and effectively communicate by voice with its higher battalion headquarters. As a result of the poor SINGGARS performance, the infantry company commander had to resort to use of the satellite-based chat capability of Blue Force Tracker to communicate with his higher headquarters. Additionally, the company commander was not able to communicate with supporting assets such as fire support and Apache helicopters that were flying in support of the company.

In contrast to SINCGARS, Soldier Radio Waveform (SRW) performance on Manpack radios was good and the company employed the Manpack radio for intra-company communications over its SRW voice and data network. The company, running SRW networks, achieved operationally effective voice ranges of 7-9 kilometers, which were extended up to

20 kilometers with radio hops. These ranges were sufficient to cover the company area of operations. SRW voice quality was consistently good. The SRW network, made up of Manpack and Rifleman Radios, disseminated digital position location information for individual dismounted Soldiers within the company SRW network, and transferred it into the brigade-wide Blue Force Tracker situational awareness network. SRW network demonstrated an operationally useful capability to support multiple talk groups on a single channel. For example, the company commander could operate the company command network, fires network, and administration/logistics network on a single SRW channel.

The third waveform employed on Manpack radios during the MOT&E was Ultra-High Frequency Satellite Communications (UHF-SATCOM) 181B. The infantry company made limited usage of UHF-SATCOM during the MOT&E, as would be expected of a company-level unit. Soldiers reported that UHF-SATCOM performance was not consistent. Due to the limited employment of this capability and its inconsistent performance further testing will be necessary to fully characterize UHF-SATCOM operational performance.

The Manpack radio program did not test all of the intended Manpack radio capabilities because they were not available for the MOT&E. The key capabilities that remain to be evaluated in future operational test events are:

- Demand Assigned Multi-Access (DAMA) UHF-SATCOM waveforms (182A and 183A)
- SINCGARS and UHF SATCOM data transmission
- Route and retransmit functions ("cross-banding")
- Multichannel operations for the combinations SINCGARS/SINCGARS and SRW/UHF-SATCOM 182A and 183A. During MOT&E, Manpack radios successfully demonstrated the capability to simultaneously operate the combinations SRW/SRW, SRW/UHF-SATCOM 181B, and SRW/SINCGARS.

Joint Enterprise Network Manager (JENM)

JENM is operationally effective. The test unit satisfactorily used JENM to import a network plan, load the radios, and monitor the SRW network. Soldiers reported that the monitoring capability has limited utility to the infantry company.

Although JENM operated as intended, there are a number of operational challenges units will encounter when fielded with Manpack radios and JENM. The process for planning and loading a network is cumbersome and time consuming. During the MOT&E, it took two Soldiers two to three days to set up and load all 46 Manpacks and 96 Rifleman Radios in the test company. A single Manpack requires up to 25 minutes to load, including cryptographic keys.

Dynamic task re-organizations remains an operational issue because of the length of time it takes to change the radio presets to match the task organization. Operational units frequently change task organizations to tailor for tactical missions. The brigade estimated it would require 48 hours to modify radio presets and load radios to allow the cross attachment of a single platoon to a different company.

Operational Suitability

JTRS HMS Manpack

JTRS HMS Manpack is not operationally suitable. This assessment is based on the Manpack radios' failure to meet required reliability and availability thresholds.

The Manpack radio has a reliability requirement of 477 hours Mean Time Between Essential Function Failure (MTBEFF) per channel. This requirement corresponds to an 86 percent probability of a Manpack radio completing a 72-hour mission without an essential function failure (EFF). During the MOT&E, the Manpack radio achieved a 132-hour MTBEFF for Channel 1 and a 155-hour MTBEFF for Channel 2. Perhaps a more meaningful metric is the MTBEFF by waveform. During the MOT&E, the Manpack radio, when running the SRW waveform, achieved an MTBEFF of 163 hours (64 percent chance of completing a 72-hour mission without an EFF). When running the SINCGARS waveform, it achieved an MTBEFF of 98 hours (48 percent chance of completing a 72-hour mission without an EFF). When running the UHF-SATCOM 181B waveform, the Manpack radio achieved an MTBEFF of 75 hours (38 percent chance of completing a 72-hour mission without an EFF).

The Manpack radio is required to achieve an operational availability (A_o) of 0.96 for each of its two channels. During the MOT&E, the Manpack radio achieved an A_o of 0.86 for Channel 1 and 0.89 for Channel 2. When measured by waveform, the SRW waveform achieved an A_o of 0.89, the SINCGARS waveform achieved an A_o of 0.80, and the UHF-SATCOM 181B waveform achieved an A_o of 0.92.

Dismounted Manpack radio operating temperatures as measured during the MOT&E are high. The military standard requires external temperatures not to exceed 120 degrees for prolonged contact or handling, and not to exceed 140 degrees for momentary contact. There were 110 temperature measurements made on the front and back surface of the radio during the MOT&E. Of these measurements, 12 percent (13 of 110) exceeded 140 degrees and 36 percent (40 of 110) exceeded 120 degrees. Soldiers reported during the test that the radio was too hot to touch and that they could not remove it from the protective carrier due to the excessive heat. The average daily high ambient temperature in the test area was 80 to 85 degrees.

Cold-start procedures for the Manpack radio require 20-25 minutes per radio. This includes powering up the radio, downloading the preset files, downloading the cryptographic keys, installing two waveforms (one per channel), and performing a communications check.

It is easy to accidentally zero the Manpack radio. When the power switch is pulled outward and turned, this action will zero the radio. This is a similar muscle memory motion required to turn on the legacy SINCGARS radio, and led unit Soldiers to inadvertently zero the Manpack radio. The Soldier then requires the 20-25 minute process described above to reload the presets and communications security to restore the radio into operation.

The Manpack radio has a weight requirement of 14.6 pounds when carried with one battery and two antennas. During the MOT&E this requirement was met. Unit Soldiers reported that they had to carry two batteries and three antennas, and under those conditions, the radio

weight was 18.8 pounds. There were several different variants of carrying harnesses used during the test and the Soldiers were dissatisfied with all three.

Vehicle integration for the Mine Resistant Ambush Protected (MRAP)-mounted Manpack radios-was poor during the MOT&E. This degraded Manpack radio performance. Proper power amplifier integration and antenna placement may have negatively affected Manpack radio SINCGARS voice range.

The single communications Soldier in the infantry company was overwhelmed by the sheer amount of communications equipment he was responsible to operate and maintain during the MOT&E. This included 46 Manpack radios and 96 Rifleman Radios, along with the JENM and associated equipment. The Army should evaluate the force structure implications of adding a large amount of new communications equipment into infantry company-level organizations. I recommend two additional signal Soldiers in the infantry company.

Joint Enterprise Network Manager (JENM)

JENM is operationally suitable. There are no requirements specified for JENM availability or reliability. During the IOT&E, there were few instances of JENM failures, and all were crew-correctable failures. There was no evidence during the IOT&E of JENM failures having an adverse impact on unit mission accomplishment. The unit identified deficiencies in JENM training and procedures that need to be integrated prior to further fielding. The Army also must determine who is going to develop the JENM network plans and presets for the multi-service units equipped with HMS radios as a result of this decision.

Future Operational Testing

The JTRS HMS Manpack radio contractor (General Dynamics) must conduct appropriate follow-on operational test and evaluation to confirm correction of deficiencies and to establish operational effectiveness and operational suitability. The Army must conduct adequate operational testing on non-program of record vendor radios.

J. Michael Gilmore
Director