ARMY RESEARCH LABORATORY

Human Factors Evaluation of the XM30 Guided Multiple Launch Rocket System (GMLRS) in the Combined High Mobility Artillery Rocket System (HIMARS)-GMLRS Initial Operational Test

by Charles L. Hernandez

ARL-TR-4113 **May 2007**

Approved for public release; distribution is unlimited.

NOTICES

Disclaimers

The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

Citation of manufacturer's or trade names does not constitute an official endorsement or approval of the use thereof.

DESTRUCTION NOTICE—Destroy this report when it is no longer needed. Do not return it to the originator.

Army Research Laboratory
Aberdeen Proving Ground, MD 21005-5425

ARL-TR-4113 **May 2007**

Human Factors Evaluation of the XM30 Guided Multiple Launch Rocket System (GMLRS) in the Combined High Mobility Artillery Rocket System (HIMARS)-GMLRS Initial Operational Test

Charles L. Hernandez
Human Research & Engineering Directorate, ARL

Approved for public release; distribution is unlimited.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.
PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE ***(DD-MM-YYYY)*** May 2007	2. REPORT TYPE Final	3. DATES COVERED (From - To) July through November 2004
4. TITLE AND SUBTITLE Human Factors Evaluation of the XM30 Guided Multiple Launch Rocket System (GMLRS) in the Combined High Mobility Artillery Rocket System (HIMARS)-GMLRS Initial Operational Test		5a. CONTRACT NUMBER 5b. GRANT NUMBER 5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S) Charles L. Hernandez (ARL)		5d. PROJECT NUMBER 62716AH70 5e. TASK NUMBER 5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Research Laboratory Human Research & Engineering Directorate Aberdeen Proving Ground, MD 21005-5425		**8. PERFORMING ORGANIZATION REPORT NUMBER** ARL-TR-4113
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Evaluation Center ATTN CSTE AEC FSE 405 Ford Ave, Park Center IV Alexandria, VA 22302-1458		10. SPONSOR/MONITOR'S ACRONYM(S) 11. SPONSOR/MONITOR'S REPORT NUMBERS

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

The primary purpose of this effort by the U.S. Army Research Laboratory (ARL) was to record Soldier-participant comments, impressions, and any recommendations for improving the guided multiple launch rocket system (GMLRS) in areas related to the design of the rocket itself and the training required to handle, maintain, and employ it with the use of the high mobility artillery rocket system (HIMARS) launcher and its associated support vehicles. The GMLRS was tested along with the HIMARS in a combined initial operational test (IOT) administered by the U.S. Army Test and Evaluation Command (ATEC). Three of the four multi-faceted questionnaires developed for the combined HIMARS-GMLRS IOT provided Soldiers with the opportunity to address GMLRS-related issues. These instruments were the military occupational specialties (MOS) 13M (MLRS crewman), 13P (Fire Direction Specialist), and 27M (MLRS Repairman). Results from this evaluation were used by ATEC (for the GMLRS system evaluation report) and ARL's Human Research and Engineering Directorate (for the human factors evaluation), in support of the Milestone C decision for full-rate production that occurred in June 2005.

15. SUBJECT TERMS
GMLRS; HFE; HIMARS; IOT

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON Charles L. Hernandez
a. REPORT UNCLASSIFIED	b. ABSTRACT UNCLASSIFIED	c. THIS PAGE UNCLASSIFIED	SAR	30	19b. TELEPHONE NUMBER ***(Include area code)*** 580-442-5051

Standard Form 298 (Rev. 8/98)
Prescribed by ANSI Std. Z39.18

Contents

List of Tables **iv**

1. Introduction **1**

2. Purpose **1**

3. Method **2**

3.1 Requirements 2

3.2 General Procedures 2

3.3 Questionnaires 3

4. Results **4**

4.1 MOS 13M Survey Results 4

4.2 MOS 13P (Fire Direction Specialist) Soldier Survey 5

4.3 MOS 27M Survey (Part II Only) Results 7

5. Conclusions **7**

6. Recommendations **7**

Appendix A. MOS 13M Survey Data **8**

Appendix B. MOS 13P Survey Data **13**

Appendix C. MOS 27MSurvey Data **19**

Acronyms **21**

Distribution List **23**

List of Tables

Table 1. Likert scale (MOS 13M Soldier survey)..... 3
Table A-1. TIS and TIMOS (RSV crews). 9
Table A-2. TIS and TIMOS (HIMARS crews). 9
Table A-3. MOS 13M survey demographic data..... 10

1. Introduction

The XM30 Guided Multiple Launch Rocket System (GMLRS) initial operational test (IOT) was conducted in conjunction with the High Mobility Artillery Rocket System (HIMARS) IOT at Fort Sill, Oklahoma, and White Sands Missile Range (WSMR), New Mexico, from 20 September to 12 November 2004. Player training was conducted from 6 July to 27 August 2004. The pilot test was conducted from 30 August to 10 September 2004. The IOT ground phase (at Fort Sill) was conducted from 20 September to 1 October 2004. The ground phase was used to evaluate the timeliness and operational connectivity of the FSC4 system from the Multiple Launch Rocket System (MLRS) battalion down to and including the launcher (*1, Para 1.2.1, CH1*). The ground phase consisted of two 96-hour field evaluation exercises during which 120 live fire missions (719 reduced range practice rockets) and 223 dry fire missions (simulating the firing of the full range of MLRS family of munitions [MFOM]) were executed. The IOT flight phase (at WSMR) was conducted in conjunction with the HIMARS IOT flight phase from 11 October to 12 November 2004, during which time, the following munitions were fired: (a) Four guided MLRS rocket rods (24 rockets), (b) one Army tactical missile system, (c) two M26 rocket pods (12 rockets), and (d) one M26A2 mission (six rockets) (*2*). For the purposes of the GMLRS IOT, the flight phase focused on the effectiveness of the GMLRS against threat representative targets, the reliability of the GMLRS, and the demonstrated safety of the GMLRS submunitions. The IOT was a comprehensive test of the operational Effectiveness, suitability and survivability of GMLRS. The U.S. Army Research Laboratory (ARL) supported the test effort and collected data to assess human factors issues during IOT mission performance.

2. Purpose

The primary purpose of this ARL effort was to record Soldier comments, impressions, and recommendations for improving the GMLRS rocket in areas related to the design of the rocket itself. Their responses also offered insights as to the training required to handle, maintain, and employ the GMLRS rocket with the HIMARS and its associated support vehicles. The Soldiers were asked to strictly limit their comments and recommendations based upon their individual experiences in the IOT.

3. Method

3.1 Requirements

ARL's Human Research and Engineering Directorate (HRED) manpower and personnel integration (MANPRINT) support for the GMLRS IOT was formalized immediately before the February 2004 combined HIMARS and GMLRS Operational Test Working Group 3 met. The scope of the MANPRINT evaluation was defined in the event design plan published by Army Test and Evaluation Command (ATEC) as an associated issue under the critical operational issue 2: Suitability. Labeled a "MANPRINT Assessment," (*1, figure 2-1, page 2-1*) in actuality, the assessment was smaller in scope and focused on obtaining Soldier comments that could be used in an IOT human factors evaluation (HFE). Whereas the primary purpose of a MANPRINT assessment is to address unresolved critical MANPRINT issues (in all seven MANPRINT domains) to the Milestone Decision Authority, the HFE conducted in this IOT supported the ATEC evaluation of the GMLRS and highlighted the operational suitability of the Soldier-system interface in an operational setting. Such an evaluation provides information to the tester as to whether Soldier-test participants can successfully operate the system being evaluated in accordance with required standards, after having been trained to meet those standards.

3.2 General Procedures

All test personnel received formal training in their military occupational specialty (MOS)-related tasks. Individual training progressed to collective training in accordance with the outline test plan (OTP) HIMARS initial operational test and evaluation (IOT&E), dated 30 August 2004 and the OTP, GMLRS IOT&E, dated 3 August 2004. On 7 September 2004, an operational test readiness statement for the combined HIMARS and GMLRS IOT&E was issued by the U.S. Army Field Artillery School that all test player personnel could satisfactorily perform individual and collective tasks to meet the standard. No other formal training and evaluation were administered to the Soldiers employing the HIMARS and GMLRS for the purposes of the test. However, the Soldier surveys contained training-related questions in which the respondents were asked to assess the level of training they felt they had achieved as a result of the IOT.

A pilot test was conducted immediately after individual and collective training. The pilot test was followed by a week of maintenance training in preparation for the record test ground phase of the IOT. The record test ground phase was conducted from 20 to 30 September 2004. Data collection throughout the period from the pilot test through the completion of the record test ground phase was performed with manual and automated methods. Manual methods included test incident reports, questionnaires designed to obtain feedback from Soldiers who participated in the test, and data collection forms completed by data collectors who were part of the Fort Sill Fire Support Test

Directorate (FSTD). Automated methods included Advanced Field Artillery Tactical Data System (AFATDS) print-outs and instrumentation installed on the launchers and fire direction equipment (*3, paragraph 4.8.3.5*).

The Fort Sill Field Element of ARL's HRED and the Fort Sill FSTD jointly developed the primary questionnaire instruments designed to obtain feedback from Soldiers who were the primary constituents in the test. These Soldiers were MOS 13M (MLRS Crewman), MOS 27M (MLRS Repairman), MOS 13P (Fire Direction Specialist), and MOS 63 series (Vehicle Maintenance) personnel. The questionnaires were administered on 4 October 2004 and at the culmination of the IOT flight phase at WSMR. In the 4 October 2004 survey session at Fort Sill, all Soldier participants (MOS 13M, 13P, 27M, and 63 series) were administered their respective questionnaires. At the culmination of the IOT flight phase, only selected 13M, 13P, and 27M Soldiers who deployed to WSMR to participate in the IOT flight phase were again administered the same questionnaires; they were asked to answer only those questions that were applicable. The answers obtained from the flight phase were combined with those from the ground phase but were not used to compare the Soldier's experiences between the ground and flight phases.

3.3 Questionnaires

Three of the four survey instruments that were developed for the combined HIMARS and GMLRS IOT provided Soldiers with the opportunity to address GMLRS-related issues. These instruments were the MOS 13M, MOS 13P, and MOS 27M Soldier questionnaires. The fourth survey instrument was the MOS 63 series Soldier questionnaire and it was only applicable to the HIMARS portion of the combined IOT.

The MOS 13M Soldier questionnaire consisted of four parts: (a) Part I: Individual and Crew Satisfaction, (b) Part II: Focused Feedback on HIMARS Launcher Operations, (c) Part III: Focused Feedback on HIMARS Resupply Vehicle/Trailer (RSV/T) Operations, (d) Part IV: Focused Feedback on GMLRS Operations. The MOS 13M survey was the most extensive of the four surveys. It required all 13M Soldiers to initially rate their levels of satisfaction or dissatisfaction with various characteristics and design features of both the HIMARS launcher and the RSV/T. They were asked to use the Likert scale described in table 1. Of the 31 questions asked in Part I, only Question 31 was applicable to the scope of the GMLRS IOT. This is discussed further in section 4 of this report, which addresses survey results.

Table 1. Likert scale (MOS 13M Soldier survey).

Scale	Description
1	**Extremely Satisfied:** This system design and capability are excellent in every respect.
2	**Satisfied:** This system design and capability are satisfactory. Any problems I encountered were very minor and did not prevent me from being able to perform my required tasks and duties.
3	**Dissatisfied:** This system design and capability are marginally satisfactory and it bothers me enough to cause me to feel like something could be done to improve the design.
4	**Extremely Dissatisfied:** This system design and capability are a problem that absolutely must be fixed. I could not perform my required tasks and duties satisfactorily all the time.
5	**NA:** (Only if you had absolutely no opportunity to use or experience the specific design or capability mentioned in the question)

For the purposes of the GMLRS IOT, neither Part II nor Part III was applicable since both were vehicle related[1]. Instead, Part IV presented seven open-ended GMLRS-related questions to the Soldiers. Part IV specifically focused on training, the use of the launcher fire control system (LFCS) to process GMLRS missions, and general handling of the GMLRS launch pod container (LPC). MOS 13M Soldier comments and responses are summarized in appendix A, with the resultant findings, based on an analysis of these responses, presented in section 4 of this report.

The MOS 13P Soldier questionnaire presented seven open-ended questions in which fire direction Soldiers from platoon to battalion level could provide feedback and comments on processing fire missions for the XM30 GMLRS based on their experiences in the IOT. MOS 13P Soldiers' comments and responses are summarized in appendix B, with the resultant findings, based on an analysis of these responses, presented in section 4 of this report.

The MOS 27M Soldier questionnaire consisted of two parts with a number of open-ended questions for each. In Part I, MOS 27M Soldiers were presented with eight questions and were asked to provide feedback and comments about maintaining and repairing the HIMARS launcher system. For the purposes of the GMLRS IOT, Part I was not applicable.[2] In Part II, Soldiers were presented with five questions and were asked to provide feedback and comments on performing troubleshooting and maintenance-related tasks on the XM30 guided MLRS rocket. The MOS 27M Soldier questionnaire was administered at Fort Sill after the ground phase of the IOT culminated and again at WSMR after the IOT flight phase culminated. Player comments and responses are summarized in appendix C, with the resultant findings, based on an analysis of these responses, presented in section 4 of this report.

4. Results

All the results discussed are based on a subjective analysis of the Soldiers' responses to the surveys they were given. The purpose of the analysis was to glean human factors insights and issues as well as recommendations for improving the XM30 GMLRS rocket.

4.1 MOS 13M Survey Results

MOS 13M training adequately prepared HIMARS crews to handle, upload, and operationally employ the GMLRS rocket. Most HIMARS crews did not experience problems or challenges when using the LFCS to process GMLRS fire missions or communicate the fire mission with AFATDS.

[1]See reference (*4*) for a complete discussion and analysis of Parts II and III of the MOS 13M Soldier survey.
[2]See reference (*4*) for a complete discussion and analysis of Part I of the MOS 27M survey.

In Part I (satisfaction/dissatisfaction), Question 31 asked MOS 13M Soldiers how satisfied or dissatisfied they were that the MLRS MFOM weapons simulator (MWS) helps to adequately train the HIMARS crew to perform essential tasks. This question was applicable to the GMLRS IOT because the MWS was upgraded to the MWSA1 for the IOT and used to represent the MFOM (including GMLRS) during dry-fire missions and during all phases of the test program when using tactical munitions was not practical (*1, para 2.7.5*). Although not specifically worded to address GMLRS, the question nevertheless implies that the MWS was intended to be used in the IOT to simulate the complete MFOM, which included the new GMLRS, and as such, gave opportunity for the player participants to register dissatisfaction if the complete MFOM was not simulated, thereby hampering training. A total of 30 player participants provided answers, of which, six were not applicable (N/A) answers. Of the remaining 24 respondents, only five indicated they were dissatisfied that the MFOM MWS helps to adequately train the HIMARS crew to perform essential tasks. Two of the five were dedicated HIMARS operators and the remaining three were dedicated RSV/T drivers. All support personnel respondents (six) were satisfied with the MWS.

In Part IV (GMLRS Operations), 92% of HIMARS crew members indicated that the training they received prepared them to properly upload a GMLRS LPC onto a HIMARS launcher and to properly execute a GMLRS fire mission. Of the HIMARS crew members, 83% indicated that they did not experience any problems or challenges using the LFCS to process GMLRS fire missions or communicate the fire mission with the AFATDS. The problems addressed by two HIMARS crew members (17%) were (a) not being able to reload software if GMLRS was the last mission selected and (b) the FCS giving a false indication of a dud in one of the launcher tubes when there were six functioning rockets. The first issue cannot be assessed to determine if there was an adverse operational impact since no additional information was provided. In the second issue, the crew chief took action to cancel the mission it was in, stowed the launcher loader module (LLM), and conducted a short-no-voltage test (SNVT). During the mission, another dud was registered in tube 6, but all six rockets safely fired during the missions. It was not until after the subsequent reload that the indication of a dud disappeared from the FCS. No other crew identified these issues and both were apparently not significant to have caused failures to complete fire missions. The RSV/T crews generally did not make entries regarding GMLRS training or the use of the LFCS to process GMLRS fire missions. The remainder of the Soldiers' comments did not highlight significant issues regarding the need to improve software interoperability between the HIMARS FCS and AFATDS for processing GMLRS fire missions. Finally, most respondents indicated that the handling and loading of GMLRS LPCs as well as processing GMLRS fire missions were accomplished without work-around procedures.

4.2 MOS 13P (Fire Direction Specialist) Soldier Survey

No significant issues were uncovered with the MOS 13P Soldier survey which pointed to software interoperability problems between the AFATDS and the HIMARS LFCS. Such interoperability

problems would have resulted in an inability to successfully fire the GMLRS with the HIMARS launcher.

Questions 1 through 3 focused on the training the Soldiers received for GMLRS and what if anything could be done to improve training. In question 1, 85% responded that they were required to receive GMLRS-specific 13P training before the test. These personnel were the primary fire direction personnel in the platoon, battery, and battalion operations centers whose IOT duties required them to regularly process GMLRS missions in some manner. All 20 13P Soldiers responded to question 2 indicating they all had received training that helped them for the GMLRS IOT. Of these, 90% of the Soldiers felt that the training they received prepared them to properly execute a GMLRS mission. The 10% (two Soldiers) who indicated that the IOT training had not prepared them to properly execute a GMLRS mission were not the same personnel who had indicated in question 1 that they were not required to receive GMLRS specific 13P training before the test. Although unconfirmed, the differences in who provided negative responses for questions 1 and 2 may have resulted from a perception that question 2 included both the formal training received before the test and any informal training the Soldiers felt they received during the test. It is a well-known fact that Army training is an ongoing endeavor that is not strictly limited to the classroom. Finally, in question 3, 20 comments were made about what can be done to make training better. Only four commented that training was sufficient and need not be improved. Eight comments seemed to corroborate Soldier perceptions that everything that occurred in the IOT was "training". Generally, these comments suggested eliminating the simulations, adding more personnel, live firing more GMLRS rockets, and making the field exercise a continuous week-long event. The few recommendations made to improve classroom instruction suggested that 13P personnel did not need 13M-related instruction, that the instructors should be knowledgeable about the subject at hand, and that the trainers should spend a little more time explaining the equipment.

Questions 4 through 7 attempted to gain feedback about the ease of use of and interoperability between the AFATDS and the HIMARS fire control system for processing GMLRS fire missions. In question 4, 35% of respondents (seven) indicated that they experienced problems or challenges when using the AFATDS to process GMLRS fire missions or communicate the fire mission with the HIMARS FCS. Five of these seven identified that their problems stemmed from receiving incomplete fire mission data for JEG[3] missions and the AFATDS communications and control unit (CCU) transmitting geometries to the launchers for no apparent reason. For the incomplete JEG mission data, all respondents indicated that they made manual entries to fill all required data fields, recalculating the mission and returning it to the launchers. None of these problems or the techniques employed by the operators could be associated with failed JEG mission time lines. In question 5, most Soldiers did not recommend software interoperability improvements based on their IOT experiences in processing GMLRS missions. For question 6, 30% of the Soldiers indicated that work-around procedures were required to successfully process a GMLRS fire

[3]JEG is a "J-code" in AFATDS for the XM30 GMLRS rocket with dual-purpose improved conventional munitions (DPICM).

mission. All the work-around procedures were again described as the manual input of fire mission data for JGEG missions that were received with incomplete information. All other respondents to question 6 indicated that they did not employ any work-around procedures to successfully execute GMLRS fire missions. Finally, in question 7, the Soldiers were asked to provide any additional comments or concerns they had regarding AFATDS software and training for processing a GMLRS fire mission, which had not already been mentioned. Of the 14 comments recorded, only four vaguely addressed AFATDS software and training, and none of these were viewed as stoppers for GMLRS mission processing.

4.3 MOS 27M Survey (Part II Only) Results

IOT training adequately prepared the MOS 27M Soldiers to conduct diagnostic tests on the GMLRS.

In Part II (GMLRS Maintenance) all the MOS 27M Soldiers indicated that the training they received prepared them to properly conduct diagnostic tests on the GMLRS LPC with the MFOM common test device (MCTD). They did not recommend changing anything to make the operations/maintenance of the MCTD better. Two of the Soldiers indicated that maintenance on the GMLRS could be made better by updating the GMLRS interactive electronic training manual and software. Finally, recommendations to improve training on the GMLRS LPC and MCTD highlighted the need to allot more time to train and focus the training on all the testing devices instead of making it a broad discussion.

5. Conclusions

The evaluation of the GMLRS IOT survey data did not reveal any significant human factors issues. Therefore, it can be concluded that the state of human factors engineering for the XM30 GMLRS enables successful handling and employment by trained HIMARS crews and support personnel.

6. Recommendations

Recommend that the ATEC accept and include the findings and conclusions presented in this report into the system evaluation report for the XM30 GMLRS rocket.

7. References

1. United States Army Test and Evaluatoin Command. Event Design Plan for XM30 GMLRS, Alexandria, VA, May 2004.
2. Fire Support Test Directorate. Final HIMARS-GMLRS IOT "Record Test" Daily Test Status Report (DTSR), Fort Sill, OK, 16 November 2004.
3. Army Test and Evaluation Command. System Evaluation Plan for HIMARS, August 2003.
4. Hernandez, C.L. Human Factors Evaluation of the High Mobility Artillery Rocket System (HIMARS) in the Combined HIMARS-Guided Multiple Launch Rocket System (GMLRS) Initial Operational Test; ARL-TR-4112; U.S. Army Research Laboratory: Aberdeen Proving Ground, 2007.
5. Headquarters, Department of the Army. The HIMARS Tactics, Techniques, and Procedures (TTP), Special Text (ST) 6-60-10, Fort Sill, OK, 24 June 2002

Appendix A. MOS 13M Survey Data

Demographics

A total of 30 Soldiers answered the MOS 13M questionnaire. Of the total, 24 personnel were evenly split (12 each) as crews for the RSV/T and crews for the HIMARS launchers. The remaining six were additional support platoon personnel with the following duty positions: Ammunition Section Chief, Reconnaissance Driver/Backup HIMARS Driver, Admin Logistics Operations Center/Battery Operations Center (ALOC/BOC) Specialist, Firing Platoon Leader, Reconnaissance Sergeant and Ammunition Platoon Sergeant. Of the total population, 18 (60%) were enlisted Soldiers (E3s and E4s), 11 (37%) were noncommissioned officers (NCOs) (E5 through E7), and one (3%) was a commissioned officer (O2).

The lowest time in service (TIS) recorded by the 24 MOS 13M soldiers who comprised the HIMARS and RSV/T crews, was 12 months, while their highest TIS was 182 months (15 yrs, 2 months). The lowest and highest times in MOS (TIMOS) for this segment of the population were also 12 months and 182 months, respectively.

The average and median months of TIS and TIMOS for the RSV crews and the HIMARS crews are shown in the following tables.

Table A-1. TIS and TIMOS (RSV crews).

13M RSV Operator Population		
	TIS	**TIMOS**
AVG	30	27
Median	27	26

Table A-2. TIS and TIMOS (HIMARS crews).

13M HIMARS Operator Population		
	TIS	**TIMOS**
AVG	77	67
Median	68	41

The complete demographic portrayal is shown in table A-3. The average and median TIS and TIMOS for the combined populations of MOS 13M HIMARS and RSV operators (excluding the support personnel) are included in the table.

Table A-3. MOS 13M survey demographic data.

Duty Positions	Identifier	Rank/Grade	TIS (Months)	TIMOS (Months)
RSV/T Operators				
RSV#5 Ammo Specialist	R1	E4	51	51
RSV Asst Driver	R2	E4	24	24
RSV Crew Member	R3	E4	28	24
Driver, RSV 2	R4	E4	26	26
RSV #7 TC	R5	E4	23	23
Ammo Specialist	R6	E3	13	13
Ammo Specialist	R7	E4	28	28
Ammo Specialist	R8	E4	38	38
RSV Driver	R9	E3	13	13
RSV Crew Member	R10	E4	25	25
RSV Driver	R11	E4	30	30
RSV/T Driver	R12	E4	64	28
HIMARS Operators				
HIMARS Driver	H1	E4	27	27
HIMARS Driver	H2	E3	12	12
HIMARS Gunner	H3	E5(P)	97	97
Launcher Chief	H4	E5	101	101
Launcher Chief	H5	E6	182	182
HIMARS Driver	H6	E4	26	26
HIMARS Driver	H7	E4	27	27
Section Chief	H8	E6	124	124
Gunner	H9	E6	156	36
Gunner	H10	E5	38	38
Gunner	H11	E5	44	44
HIMARS Section Chief	H12	E6	92	92
		13M Population AVG	**54**	**47**
		13M Population Median	**29**	**28**
Others				
Ammunition Section Chief	X1	E6	305	127
Recon Driver/Backup HIMARS Driver	X2	E3	40	10
ALOC/BOC	X3	E4	27	24
Fire Platoon Leader	X4	O2	31	23
Recon Sergeant	X5	E5	51	51
Ammo PSG	X6	E7	240	220

Part 1: Soldier Satisfaction/Dissatisfaction (N/A)[4]

Part 2: Focused Feedback HIMARS Operations (N/A)[5]

Part 3: Focused Feedback RSV/T Operations (N/A)[6]

Part 4: Focused Feedback GMLRS Operations The responses are presented as written by the Soldiers.

Questions and Answers
Q1: Do you feel the training you received prepared you to properly upload a GMLRS LPC on the HIMARS launcher?
YES: 11 Responses
NO: 0 Responses
Q2: Do you feel that the training you received prepared you to properly execute a GMLRS fire mission?
YES: 11 Responses
NO: 0 Responses
Q3: What can be done to make the training better?
Have a better PowerPoint presentation plus show a real pod.
(1) Shoot live GMLRS. (2) *(Same respondent at WSMR)* During training they should have a portion on the difference of a regular pod compared to a GMLRS pod that would be useful during pod inspection prior to uploading; such as different cables on the GMLRS that could be inspected.
(1) Faster paced lessons to prevent boredom. (2) *(Same respondent at WSMR)* Fire more live rounds.
(1) I think the training was sufficient with the hands-on portions. Training was good. (2) *(Same respondent at WSMR)* Training was done to standard
More hands-on
It seems the IOT was set up for success. The PLT and crews need more latitude. The [FM] 6-60 is there for a guideline not a book of instruction. The op areas cannot always be set up at perfect distance due to terrain and vegetation.
Q4: Did you experience any problems or challenges when using the LFCS to process GMLRS fire missions or communicate the fire mission with the AFATDS (i.e., problems with TLE (target location error), message formats, manual entry of information, readability of the digital display, etc)?
YES: 2 Responses
NO: 11 Responses
If yes, please briefly describe the problem(s) or challenge(s), how you dealt with them and indicate whether or not the problem(s) or challenge(s) were resolved.
Cannot reload software if GMLRS was last selected.
When my gunner loaded the weapons after a reload we had six rounds. When he hit launcher lay we had a dud. I told him to cancel the mission and stow. I conducted another SNVT and the FCS registered the round. I had a dud in tube 6 but tube 6 fired. After I fired the last round and conducted a reload the dud on tube 6 went away. Possible software problem.
Q5: In your opinion, is there anything that should be done to improve the software interoperability between the HIMARS FCS and AFATDS for GMLRS fire mission processing? (11 total responses)
None/No: 5 Responses
No, it seemed to be fine
Make free text messages able to be sent and received from HIMARS instead of just being able to receive. Yes but I have no input to improve the system.
Yes, the software came a long way from when we first started the IOT and many improvements were made. They

[4]For a complete discussion of Part I of the MOS 13M Soldier survey, see reference (*4*).

[5]Ibid, part 2

[6]Ibid, part 3

need to continue on this.
EOM commands need to be updated after every fire mission.
Not that I am aware of.
The problems we had were because of LIDAS (launcher instrumentation data acquisition system). The system works well.
Q6: Were there any work-around procedures that you had to use in order to:
a. Successfully process a GMLRS fire mission?
YES: 2 Responses
NO: 10 Responses
b. Successfully handle and load GMLRS LPC's?
YES: 1 Response
NO: 11 Responses
c. If you answered yes to either or both 6a and 6b, please describe the work-around procedure(s), when you had to use these procedures, and (if possible) how GMLRS operations were affected.
Two bays with right bay having rockets. Two JEG uploaded after reload.
(@WSMR) After uploading we had six rockets on board. Once we pressed launcher lay, rocket 1 became a dud and we could only fire five rounds on a six-round mission. We had to stow the LLM, disconnect the cables, re-hook up the cables and do a manual reload. After the LLM was [up] rocket 1 came up good, but rocket 6 came up as a dud. Rocket 6 was an empty bay from firing it on the first mission.
This is my personal work-around: When a dud occurs simply complete the fire mission, stow, conduct a reload and continue the mission.
Q7: Please provide any additional comments or concerns (if any) that you have regarding the training and employment of the GMLRS rocket, which have not already been mentioned (four total responses).
Good system worked every time
Training would have been better if there were more live GMLRS fire missions.
Having been to war, we would [like] to see ammo that doesn't take so long [to] process. Speed is the key to our success.
More training on the load angle of pod

Appendix B. MOS 13P Survey Data

Demographics

A total of 20 Soldiers answered the MOS 13P questionnaire. They provided the critical fire direction functions from the platoon operations center, the BOC, and the battalion operations center. Of the total population, nine (45%) were enlisted Soldiers (E2s and E4s), nine (45%) were NCOs (E5 through E7), and two (10%) were commissioned officers (O2).

The lowest TIS recorded by the 18 MOS 13P Soldiers (less the commissioned officers) was 9 months, while the highest recorded TIS was 232 months (19 yrs, 4 months). The lowest and highest recorded TIMOS were 6 months and 140 months (11 years, 8 months).

Survey Responses

In this appendix, focused feedback by MOS 13P Soldiers who received GMLRS training and supported the IOT is presented. (The responses are presented as written by the Soldiers.)

Questions and Answers
Q1: Were you required to receive GMLRS specific 13P training prior to this test?
Yes: 17 Responses
No: 3 Responses
If not, why not?
As far as it works on the fire direction center (FDC) side of the house - GMLRS is no different than the actual A270 MLRS. It's a good thing, because it allows us to cross train from HIMARS to launchers.
I'm not a 13M. I process missions. It doesn't matter what type of munition we fire. My job is to send it to the launchers.
I was not yet assigned to the unit. However, once assigned I received on-the-job training.
The GMLRS munitions were discussed so that I would understand how it works. I do not know if it was required knowledge.
Gave a better understanding of what we were getting into (familiarization) of the HIMARS launcher and its equipment.
BN FDC section with Alpha Battery was tasked out for about two weeks learning the fire direction side of the HIMARS, which was really interesting. Knowing that the HIMARS can fire any type of munitions and are really quicker on reloads as well get to the FP faster than the MLRS launchers.
We received training at the I-See-O[7] hall training area
Some of the 13P HIMARS team trained us on the GMLRS before the test got started
Two weeks in July 2004 were allocated specifically for training on the GMLRS (M30) rocket. The training was both classroom discussion and hands-on type training.
Q2: Do you feel that the training you received prepared you to properly execute a GMLRS mission?
Yes: 18 Responses
No: 2 Responses
If not, why not?

[7]Indian name of the building at Fort Sill where the Soldier received training.

Not really. Most of the material covered in class we already knew from our AIT (advanced individual training). This class doesn't cover anything new to us.
No, I did not process one fire mission during the 96-hr IOT. Both of them!
Fire missions were sent to FDC with Guided munitions. I became familiar with the nomenclature and the rest of the fire mission was handled as they normally are.
Because the training received gave us a better understanding of what we were going to be working with and at the same time how much change there was in our part 13P/AFATDS.
That's a big "Roger".
Yes because knowing how the AFATDS works with the HIMARS was pretty easy, once you got comms with them. One thing that we as 13P's had to get use to was the HIMARS only having one pod and not two so we couldn't shoot as fast as we normally do.
Yes, the instructors broke everything down easily to understand. Any questions I did have, they were around to answer them.
Yes, I have been processing missions for 36+ months now. This is just another type of munition to be fired. I feel better, however, after having some training with M30's.
Yes! Processing the GMLRS mission is the same as any other missile/rocket type mission.
Yes, Fired like any other mission.
Yes, plus I already knew what they taught.
Yes, it is pretty simple. Just change the munitions on AFATDS.
Yes the training that we received did help with the mission and made it easy to understand.
Q3: What can be done to make training better?
I felt like the training I received was sufficient for the test. I don't feel there is anything to make it better.
Better briefings at the beginning of the training exercise to better understand the set of events we are supposed to encounter. Same as having a better, set training schedule. Also a better plan can be worked out to allow a better sleep plan for the HIMARS crews.
Training for the fire direction portion could be maintained. As for the actual GMLRS crew members, better and faster ways to troubleshoot problems.
One problem that I thought could be changed was take all the simulators out the picture and concentrate only on the subject at hand which was the HIMARS performing. There was no reason to be running 24-hour ops.
Take away the simulations and add real personnel.
Have a separate block of instructions for the 13P's. A lot of briefings we had were directed at the 13M's.
More time in IOT with the HIMARS with live rounds.
Scenario base training, with battle damage assessments. The training was very straightforward, fire mission processing easy.
For skill level 1, emphasize the fact that a GMLRS round effects are interchangeable with AFATDS similar to the way a Block 1 and Block 1A are. The difference for AFATDS is range. Also emphasize that although with GMLRS MET is still important, it is nowhere near as necessary as long as the round is not jammed.
Possibly some more hands-on training with the AFATDS and actual launcher to ensure that the process is understood and how it works properly. Maybe a little more hands-on of actually processing the missions.
Fire more live rockets, to include GMLRS
Professors who actually know about the subject at hand. The instructors should be hand picked straight out of either the schoolhouse or a line battery. It needs to be someone that's been doing the job recently, not someone that hasn't been at the box for quite a bit
Well instead of the days when we came in at 3 in the morning and left at 7 just make it a week in the field.
The trainers should take more time to explain the equipment.
Excellent training
Simulation training using the mission driver before going to the field.
Myself, I thought the training we received was helpful but maybe at first we should make the classes a little longer because at first it was a little hard to understand, but after a week, I did start to pick up on it with the time I had.
Include the Support platoon FDC (fire direction center) into the equation. Don't waste the resources.

Q4: Did you experience any problems/challenges when using the AFATDS to process GMLRS fire missions or communicate the fire mission with the HIMARS FCS (i.e., problems with TLE, message formats, etc?)
Yes: 7 Responses
No: 13 Responses
If yes, please briefly describe the problem(s) or challenge(s), how you dealt with them and (if possible) how the GMLRS mission was affected.
I had numerous times when I lost connections through my modem and had to keep a constant watch on my connections. There was a time in which the AFATDS did not start up for 5 hours as we later found out our TCIM (tactical communication interface module) cards had gone bad.
Sometimes they would come down without round or the Btry would receive them without rounds. We would have the Btry put rounds in the mission.
The CCU wanted to transmit position area hazard (PAH)/target area hazard (TAH) geometries to the launchers. During the test, missions would come to us with no FS systems type, no round type, no number of rounds and AFATDS did its job to fill parameters of fire mission. However, it would split a Fire Msn. Solution seemed to be to individually manage launchers and of messed up missions etc. to select fire support system and select plain MLRS DPICM 6 Rounds, do not select specific type of munition, and let AFATDS do what it was meant to, find the best choice.
Well, the missions would sometimes be sent down intentionally with red gumball[8] because the fire support systems were not marked and the shell was not chosen nor the rounds. So I simply filled them in. We eventually sent them down after reprocessing.
While we were receiving fire missions, our box would sometimes lock up or shut down. The problem was fixed by reloading software with new info.
JEG missions were being sent without weapon model or type of rounds. We would recalculate the mission and send it back to the launchers.
Weapon model, type, count were not included when receiving JGEG missions from higher, causing the BOC in turn to input the information/data, and recalculate prior to sending the mission to the launcher.
I had no problems with processing missions with guided munitions on board.
Every mission seemed to have gone down perfectly with the same issues at a normal cycle of fire.
No problems whatsoever
The problems or challenges we faced were minor dealing with the system itself, by having modem failures periodically.
No, our end went according to plan. We never lost a mission nor did we ever lose comms, due to the type of munition we were firing.
Fire mission processing went well.
It went pretty smooth and was actually not a problem. The only thing we did have problems with was comms.
Did not use the AFATDS. It got shut down on the second day of the first week.
Q5: In your opinion, is there anything that should be done to improve the software interoperability between AFATDS and the HIMARS FCS for GMLRS fire mission processing?
There is nothing that I can recall at this time. I did not experience any difficulties.
No not really. We would always receive updates when the FCS sent it. At the same time the BOC would receive missions.
Since the GMLRS [sic] would end up being a lighter version of the A270 MLRS launcher maybe they can work out a lighter version of the FDC vehicle. Instead of a track maybe run it all out of a HMMWV.
Not really because in my opinion once we received the HIMARS data and updates and if they were correct we were ready to send rockets down range.
Other than what I have listed above; No
No, I personally don't think so. Once again I state, I'm a 13P so once we receive a mission our procedures are the same. On the other hand if there isn't anything seriously wrong, why fix it?
No the HIMARS received the mission and that's the biggest thing with MLRS.
Yes, but not with just GMLRS-type missions. All AFATDS processing should be simpler and quicker, with less

[8] a term common in computer interfaces to depict bad data; good data are designated as "green gumball".

call for fire pages to thumb through.
Find out why when data Distro (distribution) is off why AFATDS tries to push Geometries to Launchers.
No. I experienced no problems at all while processing GMLRS fire missions; the process was the same as when shooting any other type of munition.

In the BOC we encountered the problem of model and type of round not matching, missions would come in saying MLRS DPICM with a model type of M30. The mission processed the same going off of round type.
No.
Yes update it because it seems like we were running into some problems that were not our fault. There should be no reason for error if we are not at fault.
Make it so the AFATDS can accept digital messages from the Launcher.
Yes, I'm not too sure on what to improve on the software but something needs to been [sic] done about it.
Yes, travel lock failure on HIMARS. May be already taken care of.
For some reason AFATDS tried to send the PAH's and TAH's geometry for JEG down to the launcher.
Other than the issue raised in Q4 no necessary improvements seem imperative, upon completion of the two-week field problem.
No not really. I think that the systems are pretty much the same. I think that the system is probably better.
I don't know didn't use it.
Q6: Were there any work-around procedures required to successfully process a GMLRS fire mission?
Yes: 6 Responses
No: 13 Responses
If yes, please describe the work-around procedure(s), when you had to use these procedures, and how GMLRS fire mission and FDC operations were affected.
Sometimes when a fire mission was received, the mission came up in my box with no munitions, so I had to go to the attack options tab and go through order to fire to give the proper munitions. This had also occurred with various other munitions, which would lead me to believe that was an AFATDS issue, not a munitions issue.
One thing that I could say was troubleshooting the radio at one time.
The Btry would receive the mission without rounds and would have to insert rounds in the mission.
On occasion a launcher would not be a viable attack option and the status we seen was correct. So we would send it down using the send selected button from the Attack Options Tab. Launcher would process mission correctly but would have to hold a mission in our IP where the radio buttons turned black until mission was completed, or launcher would receive a EOM (end of mission)/denied fire mission.
Refer to question 4's answer on that. Refer to Q4.
IOT seemed to have went perfectly in regards to the actual HIMARS launchers.
None whatsoever.
No, Not at all to my knowledge.
Q7: Please provide any additional comments or concerns (if any) that you have regarding AFATDS software and training for processing a GMLRS fire mission, which have not already been mentioned.
No further comments at this time. I have no additional comments.
AFATDS software was all fine except when dealing with the simulators, when we would come across commo problems.
Job purpose, Since the 13P had more involvement with fire mission processing, Soldiers who excelled should have been the ones to be recognized instead of the personal [sic] who just drove around (data collectors) [awards/coins]
None. None at this time.
I think training and learning how HIMARS work was pretty interesting and not that difficult to adapt to.
I thought the test went on very smoothly. There are some bugs to be worked out of the launcher but other than that the launcher seems to be pretty reliable.
Like everything else in life, there will be glitches. Just keep researching and testing these systems. I'm convinced everything will be fine. "STEEL"
The test ran very smooth and in a timely manner.

We spent 3 months completely dedicated to this HIMARS test. Not consecutive but 3 months. We have Soldiers who did not receive an award or a coin for their time, something to look back on and say they were a part of the initial testing for an military hardware/software equipment. Tell me, what does a section chief say to a Soldier who receives nothing but works just as hard as anyone else on the testing?
I do believe for the most part AFATDS in this version works well with GMLRS and it will improve with the next version of AFATDS
As earlier stated, I think there should be more hands on training so that not only 13P's but 13M's also have time to experience the full process of shooting a GMLRS mission.
The AFATDS can send digital messages to the launchers, but it can't receive them back. I feel that the AFATDS should be able to receive those messages.
When receiving MET, the AFATDS would sometime shut down. What is up?
Safety data calculator - sometimes software didn't work - we had to input MET data - but after then no problem.
No not any. I think that this new GMLRS is pretty good but could be better.
If you include a Support PLT FDC in an IOT then use them for just that.

INTENTIONALLY LEFT BLANK

Appendix C. MOS 27MSurvey Data

Demographics

A total of four Soldiers (80%) and one commissioned officer (20%) answered the MOS 27M questionnaire.

The lowest TIS recorded by the four MOS 27M Soldiers (less the commissioned officer) was 23 months (1 year, 11 months), while the highest recorded TIS was 61 months (5 yrs, 1 month). The lowest and highest recorded TIMOS were 19 months (1 year, 7 months) and 42 months (3 years, 6 months). All four MOS 27M Soldiers were Specialists (E4).

Part 1: Focused Feedback HIMARS Launcher Maintenance (N/A)[9]

Part 2: GMLRS Maintenance

Questions and Answers	No. of Responses
Q1: Do you feel training prepared you to properly conduct diagnostic tests on the GMLRS LPC with the MCTD?	
Yes?	4
No?	0
Q2: What can be done to make training on the GMLRS LPC and MCTD better?	
More time on maintenance of the MCTD since it is a tool given to 27M's.	1
(1) Nothing. (2) *(Same respondent at WSMR)* Longer than a week training.	1
(1) Make the training more narrowed down to specifics to all the testing devices instead of making it a broad discussion. (2) *(Same respondent at WSMR)* None.	1
(1) A little more time to train, not rushing us through it. (2) *(Same respondent at WSMR)* Nothing.	1
Q3: What would you change to make the operations/maintenance of the MCTD better?	
None / Nothing	4
Q4: What would you change to make maintenance of the GMLRS better?	2
(1) Nothing	1
(1) The software. (2) *(Same respondent at WSMR)* Nothing.	1
Q5: Please provide any additional training- and maintenance-related comments or concerns (if any) that you have regarding the GMLRS rocket, which have not already been mentioned.	
None/Nothing	4

[9]For a complete discussion of Part I of the MOS 27M Soldier survey, see reference (*4*).

INTENTIONALLY LEFT BLANK

Acronyms

AFATDS	Advanced Field Artillery Tactical Data System
AIT	advanced individual training
ALOC	admin logistics operations center
ARL	Army Research Laboratory
ATEC	Army Test and Evaluation Command
BOC	battery operations center
CCU	communications and control unit
FCS	fire control system
FDC	fire direction center
FSTD	Fire Support Test Directorate
GMLRS	Guided Multiple Launch Rocket System
HFE	Human factors Evaluation
HIMARS	High Mobility Artillery Rocket System
HRED	Human Research and Engineering Directorate
IOT	initial operational test
IOT&E	initial operational test and evaluation
LFCS	launcher fire control system
LIDAS	launcher instrumentation data acquisition system
LPC	launch pod container
LLM	launcher loader module
MANPRINT	Manpower and Personnel Integration
MCTD	MFOM Common Test Device
MFOM	Multiple Launch Rocket System Family of Munitions
MLRS	Multiple Launch Rocket System
MOS	military occupational specialty
MOS 13M	MLRS Crewman
MOS 13P	Fire Direction Specialist
MOS 27M	MLRS Repairman
MOS 63	Vehicle Maintenance

MWS, MWSA1	MFOM Weapons Simulator
NCO	noncommissioned officer
OTP	outline test plan
PLT	platoon
RSV/T	resupply vehicle and trailer
SNVT	short-no-voltage-test
TIMOS	time in MOS
TIS	time in service
WSMR	White Sands Missile Range

NO. OF COPIES	ORGANIZATION
1 (PDF Only)	DEFENSE TECHNICAL INFORMATION CTR DTIC OCA 8725 JOHN J KINGMAN RD STE 0944 FORT BELVOIR VA 22060-6218
1	US ARMY RSRCH DEV & ENGRG CMD SYSTEMS OF SYSTEMS INTEGRATION AMSRD SS T 6000 6TH ST STE 100 FORT BELVOIR VA 22060-5608
1	DIRECTOR US ARMY RESEARCH LAB IMNE ALC IMS 2800 POWDER MILL RD ADELPHI MD 20783-1197
1	DIRECTOR US ARMY RESEARCH LAB AMSRD ARL CI OK TL 2800 POWDER MILL RD ADELPHI MD 20783-1197
2	DIRECTOR US ARMY RESEARCH LAB AMSRD ARL CS OK T 2800 POWDER MILL RD ADELPHI MD 20783-1197
1	ARMY RSCH LABORATORY - HRED ATTN AMSRD ARL HR M DR M STRUB 6359 WALKER LANE SUITE 100 ALEXANDRIA VA 22310
1	ARMY RSCH LABORATORY - HRED ATTN AMSRD ARL HR ML J MARTIN MYER CENTER RM 2D311 FT MONMOUTH NJ 07703-5601
1	ARMY RSCH LABORATORY - HRED ATTN AMSRD ARL HR MZ A DAVISON 199 E 4TH ST STE C TECH PARK BLDG 2 FT LEONARD WOOD MO 65473-1949
1	ARMY RSCH LABORATORY - HRED ATTN AMSRD ARL HR MD T COOK BLDG 5400 RM C242 REDSTONE ARSENAL AL 35898-7290

NO. OF COPIES	ORGANIZATION
1	COMMANDANT USAADASCH ATTN AMSRD ARL HR ME A MARES 5800 CARTER RD FT BLISS TX 79916-3802
1	ARMY RSCH LABORATORY - HRED ATTN AMSRD ARL HR MO J MINNINGER BLDG 5400 RM C242 REDSTONE ARSENAL AL 35898-7290
1	ARMY RSCH LABORATORY - HRED ATTN AMSRD ARL HR MM DR V RICE-BERG BLDG 4011 RM 217 1750 GREELEY RD FT SAM HOUSTON TX 78234-5094
1	ARMY RSCH LABORATORY - HRED ATTN AMSRD ARL HR MG R SPINE BUILDING 333 PICATINNY ARSENAL NJ 07806-5000
1	ARL HRED ARMC FLD ELMT ATTN AMSRD ARL HR MH C BURNS BLDG 1467B ROOM 336 THIRD AVENUE FT KNOX KY 40121
1	ARMY RSCH LABORATORY - HRED AVNC FIELD ELEMENT ATTN AMSRD ARL HR MJ D DURBIN BLDG 4506 (DCD) RM 107 FT RUCKER AL 36362-5000
1	ARMY RSCH LABORATORY - HRED ATTN AMSRD ARL HR MK MR J REINHART 10125 KINGMAN RD FT BELVOIR VA 22060-5828
1	ARMY RSCH LABORATORY - HRED ATTN AMSRD ARL HR MV HQ USAOTC S MIDDLEBROOKS 91012 STATION AVE ROOM 111 FT HOOD TX 76544-5073
1	ARMY RSCH LABORATORY - HRED ATTN AMSRD ARL HR MY M BARNES 2520 HEALY AVE STE 1172 BLDG 51005 FT HUACHUCA AZ 85613-7069
1	ARMY RSCH LABORATORY - HRED ATTN AMSRD ARL HR MP D UNGVARSKY BATTLE CMD BATTLE LAB 415 SHERMAN AVE UNIT 3 FT LEAVENWORTH KS 66027-2326

NO. OF COPIES	ORGANIZATION
1	ARMY RSCH LABORATORY - HRED ATTN AMSRD ARL HR MJK J HANSBERGER JFCOM JOINT EXPERIMENTATION J9 JOINT FUTURES LAB 115 LAKEVIEW PARKWAY SUITE B SUFFOLK VA 23435
1	ARMY RSCH LABORATORY - HRED ATTN AMSRD ARL HR MQ M R FLETCHER US ARMY SBCCOM NATICK SOLDIER CTR AMSRD NSC SS E BLDG 3 RM 341 NATICK MA 01760-5020
1	ARMY RSCH LABORATORY - HRED ATTN AMSRD ARL HR MY DR J CHEN 12423 RESEARCH PARKWAY ORLANDO FL 32826
1	ARMY RSCH LABORATORY - HRED ATTN AMSRD ARL HR MS MR C MANASCO SIGNAL TOWERS 118 MORAN HALL FORT GORDON GA 30905-5233
1	ARMY RSCH LABORATORY - HRED ATTN AMSRD ARL HR MU M SINGAPORE 6501 E 11 MILE RD MAIL STOP 284 BLDG 200A 2ND FL RM 2104 WARREN MI 48397-5000
5	ARMY RSCH LABORATORY - HRED ATTN AMSRD ARL HR MF MR C HERNANDEZ BLDG 3040 RM 220 FORT SILL OK 73503-5600
1	ARMY RSCH LABORATORY - HRED ATTN AMSRD ARL HR MW E REDDEN BLDG 4 ROOM 332 FT BENNING GA 31905-5400
1	ARMY RSCH LABORATORY - HRED ATTN AMSRD ARL HR MN R SPENCER DCSFDI HF HQ USASOC BLDG E2929 FORT BRAGG NC 28310-5000
1	ARMY G1 ATTN DAPE MR B KNAPP 300 ARMY PENTAGON ROOM 2C489 WASHINGTON DC 20310-0300

NO. OF COPIES	ORGANIZATION
	ABERDEEN PROVING GROUND
1	DIRECTOR US ARMY RSCH LABORATORY ATTN AMSRD ARL CI OK TECH LIB BLDG 4600
1	DIRECTOR US ARMY RSCH LABORATORY ATTN AMSRD ARL CI OK TP S FOPPIANO BLDG 459
1	DIRECTOR US ARMY RSCH LABORATORY ATTN AMSRD ARL HR MR F PARAGALLO BLDG 459