# REPORT DOCUMENTATION PAGE

*Form Approved*
*OMB No. 0704-0188*



| 1. REPORT DATE *(DD-MM-YYYY)* | 2. REPORT TYPE | 3. DATES COVERED *(From - To)* |
|---|---|---|
| **04/11/2013** | **Final Report** | 09/2011 – 09/2012 |

**4. TITLE AND SUBTITLE**

Digital Fire Control Systems Support

**5a. CONTRACT NUMBER**
**DOTC-09-01-INIT031**

**5b. GRANT NUMBER**

**5c. PROGRAM ELEMENT NUMBER**

**5. AUTHOR(S)**

Indra Nayee

**5d. PROJECT NUMBER**

**5e. TASK NUMBER**

**5f. WORK UNIT NUMBER**

**6. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)**
**Subsystem Technologies, Inc.**
**410 Route 15 South, Wharton, NJ 07885**

**8. PERFORMING ORGANIZATION REPORT NUMBER**

**9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)**

US Army Armament Research, Development and Engineering Center
Picatinny Arsenal, Picatinny, NJ 07806

**10. SPONSOR/MONITOR'S ACRONYM(S)**

ARDEC

**11. SPONSOR/MONITOR'S REPORT NUMBER(S)**

**12. DISTRIBUTION / AVAILABILITY STATEMENT**

Public

**13. SUPPLEMENTARY NOTES**

None

**14. ABSTRACT**

The objective of this initiative is to provide support for software development which includes software coding, Software Document Review and Updates, Software Requirements review and generation, participation in Integrated Product Development Team (IPT) meetings, System Integration Testing and equipment support, and Technical Reviews. SUBSYSTEMs shall provide all personnel, facilities, equipment, supplies and materials needed to accomplish the work under this contract for work performed at sites other than Picatinny Arsenal. RDECOM ARDEC, in support of the PM Joint Lightweight 155, has been tasked to develop and maintain the Digital Fire Control Systems (DFCS) for the M119A2 and M777A2. The DFCS is a fully integrated digital fire control system that has weapon platform application to the Lightweight 155 mm (LW155) Towed Howitzer and the M119A2 Lightweight 105mm Towed Howitzer.

**15. SUBJECT TERMS**

Digital Fire Control Systems (DFCS)

| 16. SECURITY CLASSIFICATION OF: N/A | | | 17. LIMITATION OF ABSTRACT | 18. NUMBER OF PAGES | 19a. NAME OF RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| a. REPORT | b. ABSTRACT | c. THIS PAGE | UU | 5 | Indra Nayee |
| | | | | | 19b. TELEPHONE NUMBER *(include area code)* 973.989.8001 |

# Final Technical Status Report

**For**

# Digital Fire Control Systems Support

**Initiative No: DOTC-09-01-INIT031**

**Reporting Period: July 2012 – September 2012**

**Ordnance Technology Initiative Team**

**Subsystem Technologies, Inc.**

**SME**


**Initiative Team Technical POC**

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***Submitted: September 27, 2012***

## 1. Comments on Technical/Cost/Schedule Performance:

RDECOM ARDEC, in support of the PM Joint Lightweight 155, has been tasked to develop and maintain the Digital Fire Control Systems (DFCS) for the M119A2 and M777A2. The DFCS is a fully integrated digital fire control system that has weapon platform application to the Lightweight 155 mm (LW155) Towed Howitzer and the M119A2 Lightweight 105mm Towed Howitzer. The DFCS will allow for rapid emplacement and execution of fire missions to minimize the time to action. The DFCS will provide crew controls and displays, position location, navigation, gun tube laying aids, system command and control functions, digital communications, power supply and power management, Built-In-Test (BIT), Excalibur and Precision Guidance Kit firing capabilities. The DFCS software is derived from the Mortar Fire Control System software.

The objective of this initiative is to provide support for software development which includes software coding, Software Document Review and Updates, Software Requirements review and generation, participation in Integrated Product Development Team (IPT) meetings, System Integration Testing and equipment support, and Technical Reviews. SUBSYSTEMs shall provide all personnel, facilities, equipment, supplies and materials needed to accomplish the work under this contract for work performed at sites other than Picatinny Arsenal. The Government will provide facilities, equipment, supplies and materials for work performed at Picatinny Arsenal to accomplish the work under this contract.

During this reporting period, one modification was implemented through contract modification. During this period, SUBSYSTEMs provided the mortar gunners display converted to Artillery Gunners Displays (new dark green housing) and connector right angle display. The effort was to convert Mortar Gunners Display 02-1578-09 to the Artillery Gunners Display 02-1742-03 with the version 3.06 software and new dark green housing. The units were upgraded to meet the color requirements per MIL-DTL-53039, color Green 383, and Color No. 34097 per FED-STD-595. The software was flashed using the version 3.06 software released for the artillery systems. The units underwent the complete release testing and part marking as to the Artillery Gunners Display.

SUBSYSTEMs completed the modification to Artillery Portable Universal Battery Supply (APUB) and delivered a prototype to government for testing and validation. This effort is the present application of digital fire control to the 105mm M119A2 Towed Howitzer to provide automated navigation/weapon pointing and digital communications for improved responsiveness, survivability and first round fire for effect capability of that howitzer. Innovative design techniques and technologies previously applied on lightweight howitzer and mortar systems are being utilized.

SME provided inputs to APUBS ICD and performance specification. The inputs were provided to APDA ICD during this reporting period to update the APDA performance specifications. SME participated in INU FAMECA during the month of November.

Current tasks are on schedule and performing within the allocated budgets. The cost and schedule performance of this initiative meets customer’s requirements.

## 2. Initiative Quad Chart

<table>
<tr><th colspan="2">Digital Fire Control Systems Support</th></tr>
<tr><td colspan="2"></td></tr>
<tr><th>Goals & Objectives</th><th>Initiative Information</th></tr>
<tr><td>The objective of this initiative is to provide support for software development which includes software coding, Software Document Review and Updates, Software Requirements review and generation, participation in Integrated Product Development Team (IPT) meetings, System Integration Testing and equipment support, and Technical Reviews. SUBSYSTEMs shall provide all personnel, facilities, equipment, supplies and materials needed to accomplish the work under this contract for work performed at sites other than Picatinny Arsenal. The Government will provide facilities, equipment, supplies and materials for work performed at Picatinny Arsenal to accomplish the work under this contract.</td><td>Initiative Lead: Subsystem Technologies, Inc<br>Team Members: SME<br>Period of Performance: August 30, 2011 – December 30, 2012.<br><br>Initiative Modifications:<br>Mod 1 updated period of performance (through October 2011)<br>Mod 2 change in alternate AOR<br>Mod 3 change in alternate AOR<br>Mod 4 updated period of performance (through November 2011)<br>Mod 5 ATI Internal change<br>Mod 6 updated period of performance (through December 2012)<br>Mod 7 increase funding</td></tr>
<tr><th>Milestones & Technical Achievements</th><th>Implementation & Payoff</th></tr>
<tr><td>July 2: IPT Meeting<br>July 11: Technical Interchange Meeting<br>July 18: Status update meeting<br>July 26: Test procedure review meeting<br>August 1: Testing of APDA<br>August 8: IPT participation<br>August 14: Status updated meeting<br>August 22: Field test<br>September 6: Status update meeting<br>September 12: TDP review meeting</td><td>Schedule: Updated Milestones Table to match the statement of work and modified scope of tasks<br>Status: Cost and schedule performance of the initiative meets customer’s requirements<br><br>Successful completion of study will quantify the improvements (reduce collateral damage, enhance lethality, and improve weapon effectiveness) necessary per SOW.</td></tr>
<tr><td colspan="2"><u>Current Status:</u> Technical = Green/Yellow/Red (delta) Schedule = Green/Yellow/Red (delta) Cost = Green/Yellow/Red (delta)</td></tr>
</table>

***Current Status Legend*:** Green = Good/On Budget Yellow = Minor Weakness/Known Risk Red = Major Weakness/Critical
Delta: ⇧ = upgrade from last assessment; ⇩ = downgrade from last assessment; ⇨ = no change

## 3. Supplemental Information

The following sections summarize the activities for this quarter:

### 3.1 Technical Achievements

SUBSYSTEMs provided the Mortar Gunners Display converted to Artillery Gunners Displays (new dark green housing) and connector right angle display. The effort was to convert Mortar Gunners Display 02-1578-09 to the Artillery Gunners Display 02-1742-03 with the version 3.06 software and new dark green housing. The units were upgraded to meet the color requirements per MIL-DTL-53039, color Green 383, and Color No. 34097 per FED-STD-595. The software was flashed using the version 3.06 software released for the artillery systems. The units underwent the complete release testing and part marking as to the Artillery Gunners Display.

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**Milestone Status**:

| Mile-stone No. | Deliverable Description | Due Date | % Complete this period | Cumulative % complete |
|---|---|---|---|---|
| 1 | Initiative Management Plan & Software Plan | 9/20/2011 | 100% | 100% |
| 2 | Quarterly Technical and Business Status Report | 9/20/2011 | 100% | 100% |
| 3 | Progress Report: Software development | 10/10/2011 | 100% | 100% |
| 4 | Modified APDA Units (10) | 10/30/2011 | 100% | 100% |
| 5 | Quarterly Technical & Business Status Report | 12/20/2011 | 100% | 100% |
| 6 | Progress Report: Software development | 2/15/2012 | 100% | 100% |
| 7 | Quarterly Technical & Business Status Report | 3/20/2012 | 100% | 100% |
| 8 | Modified Artillery Gunners Display | 5/15/2012 | 100% | 100% |
| 9 | Progress Report: Technical Support | 6/15/2012 | 100% | 100% |
| 10 | Quarterly Technical & Business Status Report | 6/20/2012 | 100% | 100% |
| 11 | Quarterly Technical & Business Status Report | 9/20/2012 | 100% | 100% |
| 12 | Progress Report: Technical Support | 09/30/2012 | 100% | 100% |
| 13 | Modified APBUBS) w/Software version 3.06 | 09/30/2012 | 100% | 100% |
| 14 | Final Technical and Business Status Report | 09/30/2012 | 100% | 100% |

**Technical Readiness Level Status: Not applicable**

### 3.2 Problems Encountered and Action Taken

- *Changes to the initiative objective or schedule:*
  No changes to the initiative objective or schedule were encountered. The period of performance was extended until December 2012 to meet the additional task requirements
- *Technical problems and approach to correct:*
  There were no technical problems encountered during this reporting period
- *Schedule problems and approach to correct:*
  There were no schedule problems reported
- *Risks identified and mitigation plans:*
  There were no identified risks during this reporting period

### 3.3 Technology Transfer

- No technology transfer identified during this reporting period other than the successful completion of gunners displays converted to Artillery Gunners Displays (new dark green housing).

### 3.4 Plans for Next Quarter

The plans for next quarter are:

- Completion of milestones listed for next quarter
- Complete the study of system requirements for digital fire control for power management
- Complete design review and improvement recommendations for portable universal battery