

# 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 of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Service, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

|                                  |                             |                                                                           |
|----------------------------------|-----------------------------|---------------------------------------------------------------------------|
| 1. AGENCY USE ONLY (Leave blank) | 2. REPORT DATE<br>August 99 | 3. REPORT TYPE AND DATES COVERED<br>Final Report: 4 Aug 98 thru 30 Apr 99 |
|----------------------------------|-----------------------------|---------------------------------------------------------------------------|

|                                                                           |                    |
|---------------------------------------------------------------------------|--------------------|
| 4. TITLE AND SUBTITLE<br>Investigate DMSMS Impact on Selected Spare Parts | 5. FUNDING NUMBERS |
|---------------------------------------------------------------------------|--------------------|

|                                |  |
|--------------------------------|--|
| 6. AUTHOR(S)<br>Gary A. Maddux |  |
|--------------------------------|--|

|                                                                                                              |                                                               |
|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)<br>Univ. of Alabama in Huntsville<br>Huntsville, AL 35899 | 8. PERFORMING ORGANIZATION REPORT NUMBER<br>5-20237 & 5-20238 |
|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|

|                                                                                                                                                           |                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)<br>AMSAM-RD-SE-IO (D. FREY)<br>U.S. Army Aviation & Missile Command<br>Redstone Arsenal, AL 35898 | 10. SPONSORING/MONITORING AGENCY REPORT NUMBER |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|

11. SUPPLEMENTARY NOTES

|                                                                                                     |                             |
|-----------------------------------------------------------------------------------------------------|-----------------------------|
| 12a. DISTRIBUTION/AVAILABILITY STATEMENT<br>Approved for Public Release; Distribution is unlimited. | 12b. DISTRIBUTION CODE<br>A |
|-----------------------------------------------------------------------------------------------------|-----------------------------|

13. ABSTRACT (Maximum 200 words)

The IOD, SEPD, RDEC, AMCOM has the mission to establish processes for identifying and resolving the problems associated with Diminishing Manufacturing Sources and Material Shortages (DMSMS). The objective of the DMSMS Program is to support readiness by minimizing obsolescence/nonavailability problems in Army equipment. This objective is achieved by taking proactive and reactive steps to support development and implementation of solutions that preserve readiness and support Army goals. Investigation and analysis of the impact of diminishing manufacturing sources and material shortages ensures that design changes are incorporated only after a systematic technical evaluation and review of the total cost and effect of the change is conducted. The systems engineering analysis evaluates the long-term life cycle consequences and impact on the manufacturability, maintainability and supportability of the overall weapon system.

19991004 041

|                                          |                          |
|------------------------------------------|--------------------------|
| 14. SUBJECT TERMS<br>obsolescence: DMSMS | 15. NUMBER OF PAGES<br>3 |
|                                          | 16. PRICE CODE           |

|                                       |                                          |                                         |                            |
|---------------------------------------|------------------------------------------|-----------------------------------------|----------------------------|
| 17. SECURITY CLASSIFICATION OF REPORT | 18. SECURITY CLASSIFICATION OF THIS PAGE | 19. SECURITY CLASSIFICATION OF ABSTRACT | 20. LIMITATION OF ABSTRACT |
|---------------------------------------|------------------------------------------|-----------------------------------------|----------------------------|

PLEASE CHECK THE APPROPRIATE BLOCK BELOW

DAO# \_\_\_\_\_

\_\_\_\_\_ copies are being forwarded. Indicate whether Statement A, B, C, D, E, F, or X applies.

DISTRIBUTION STATEMENT A:  
APPROVED FOR PUBLIC RELEASE: DISTRIBUTION IS UNLIMITED

DISTRIBUTION STATEMENT B:  
DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES ONLY; (indicate Reason and Date). OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO (Indicate Controlling DoD Office).

DISTRIBUTION STATEMENT C:  
DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND THEIR CONTRACTS (Indicate Reason and Date). OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO (Indicate Controlling DoD Office).

DISTRIBUTION STATEMENT D:  
DISTRIBUTION AUTHORIZED TO DoD AND U.S. DoD CONTRACTORS ONLY; (Indicate Reason and Date). OTHER REQUESTS SHALL BE REFERRED TO (Indicate Controlling DoD Office).

DISTRIBUTION STATEMENT E:  
DISTRIBUTION AUTHORIZED TO DoD COMPONENTS ONLY; (Indicate Reason and Date). OTHER REQUESTS SHALL BE REFERRED TO (Indicate Controlling DoD Office).

DISTRIBUTION STATEMENT F:  
FUTHER DISSEMINATION ONLY AS DIRECTED BY (Indicate Controlling DoD Office and Date) or HIGHER DoD AUTHORITY.

DISTRIBUTION STATEMENT X:  
DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND PRIVATE INDIVIDUALS OR ENTERPRISES ELIGIBLE TO OBTAIN EXPORT-CONTROLLED TECHNICAL DATA IN ACCORDANCE WITH DoD DIRECTIVE 5230.25. WITHHOLDING OF UNCLASSIFIED TECHNICAL DATA FROM PUBLIC DISCLOSURE, 6 Nov 1984 (indicate date of determination). CONTROLLING DoD OFFICE IS (Indicate Controlling DoD Office).

This document was previously forwarded to DTIC on \_\_\_\_\_ (date) and the AD number is \_\_\_\_\_.

In accordance with provisions of DoD instructions. The document requested is not supplied because:

It will be published at a later date. (Enter approximate date, if known).

Other. (Give Reason)

DoD Directive 5230.24, "Distribution Statements on Technical Documents," 18 Mar 87, contains seven distribution statements, as described briefly above. Technical Documents must be assigned distribution statements.

GARY A. MADDUX

Print or Type Name

256 890 6343 x 223

Telephone Number

Gary A. Maddux 25 Aug 99

Authorized Signature/Date

Technical Report 5-20237 & 5-20238  
Contract No. DAAH01-98-D-R001  
Delivery Order No. 17

**Investigate DMSMS Impact on Selected Spare Parts**

(5-20237 & 5-20238)

Final Technical Report for Period  
4 August 98 through 30 April 1999

August 1999

Prepared by:

Gary A. Maddux

Systems Management & Production Lab  
The University of Alabama in Huntsville  
Huntsville, Alabama 35899

Prepared for:

U.S. Army Aviation & Missile Command  
Redstone Arsenal, AL 35898  
Attn.: Mr. Dan Frey

## PREFACE

This technical report was prepared by the staff of the Research Institute, The University of Alabama in Huntsville. The purpose of this report is to provide documentation of the work performed and results obtained under Delivery Order 17 of AMCOM Contract No. DAAH01-98-D-R001. Mr. Gary Maddux was the principal investigator. Mr. Dan Frey, Industrial Operations Division, Systems Engineering and Production Directorate, Research, Development, and Engineering Center, U.S. Army Aviation & Missile Command, provided technical coordination.

The views, opinions, and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision unless so designated by other official documentation.

Except as provided by the Contract Data Requirements List DD Form 1423, hereof, the distribution of any contract report in any state of development or completion is prohibited without the approval of the Contracting Officer.

Prepared for: Commander  
U.S. Army Aviation & Missile Command  
Redstone Arsenal, AL 35898

I have reviewed this report, dated August 1999 and the report contains no classified information.

  
\_\_\_\_\_  
Principal Investigator

## TABLE OF CONTENTS

|     |                                       |   |
|-----|---------------------------------------|---|
| 1.0 | INTRODUCTION.....                     | 1 |
| 2.0 | OBJECTIVES .....                      | 1 |
| 3.0 | STATEMENT OF WORK .....               | 1 |
| 4.0 | ANALYSIS OF DMSMS IMPACTS .....       | 2 |
| 5.0 | CONCLUSIONS AND RECOMMENDATIONS ..... | 2 |

## **1.0 Introduction**

The Industrial Operations Division (IOD), SEPD, RDEC, AMCOM has the mission to establish processes for identifying and resolving the problems associated with Diminishing Manufacturing Sources and Material Shortages (DMSMS). The objective of the DMSMS Program is to support readiness by minimizing obsolescence/nonavailability problems in Army equipment. This objective is achieved by taking proactive and reactive steps to support development and implementation of solutions that preserve readiness and support Army goals. Investigation and analysis of the impact of diminishing manufacturing sources and material shortages ensures that design changes are incorporated only after a systematic technical evaluation and review of the total cost and effect of the change is conducted. The systems engineering analysis evaluates the long-term life cycle consequences and impact on the manufacturability, maintainability and supportability of the overall weapon system.

In order to fulfill its mission, IOD required research, analysis and evaluation of diminishing manufacturing sources and material shortages in all areas related to spare parts and components. This research effort concluded with a detailed analysis of the impact on spare parts from changes due to diminishing manufacturing sources and material shortages.

## **2.0 Objective**

The objective of the work performed under this task order was to research, evaluate, investigate and analyze the impact of diminishing manufacturing sources and material shortages in all areas related to components on selected spare parts. Recommendations were presented to the Industrial Operations Division in the form of briefings, reports and other methods as required.

## **3.0 Statement of Work**

The statement of work, as outlined in delivery order 17, was as follows:

- 3.1 UAH shall study the development of a Mechanical Obsolescence/Sustainment Program for implementation by the Industrial Operations Division. UAH shall attempt to utilize the information gathered during the Tech Loop Screening Process as well as information from the Command Readiness Reviews in the formulation of this program. The program shall contain the types of problems which could be resolved, the method of resolution, funding avenues, and a cost saving/tracking process. The program should include the use of government-furnished databases and other automated tools UAH deems suitable and necessary.

- 3.2 UAH shall provide solutions for DMSMS/obsolescence problems which arise from this effort. Solutions shall be presented with sufficient documentation to justify design change considerations. UAH shall not only present solutions that are unique to the subsystem, but shall also utilize solutions that have been developed for other weapon systems within the Army and DoD when applicable.
- 3.3 UAH shall assess system impacts from DMSMS where applicable. UAH shall evaluate component substitution and redesign or other solution options for components impacted by DMSMS.
  - 3.3.1 UAH shall assess the impact of diminishing manufacturing sources on system supportability. UAH shall evaluate and develop problem resolution approaches.
    - (1) UAH shall define/refine assessment methods utilized for DMSMS affected components. Document analysis methods, data sources, criteria and reporting format.
    - (2) Identify alternate sources, part numbers and qualified substitutes for obsolete or unavailable components. Verify compliance with military and commercial standards. Recommend specific alternate and substitute parts. Propose potential approaches to resolve availability and obsolescence problems and to reduce their impacts on system supportability.
    - (3) UAH shall identify technology insertion opportunities. Identify opportunities for insertion of new technologies into systems through redesign. Identify LRUs or boards that are candidates for redesign based on their use of obsolete microelectronics.

#### **4.0 Analysis of DMSMS Impacts**

Under this task members of the UAH Systems Management and Production Lab performed a detailed engineering analysis on the impacts of DMSMS on selected component parts of several AMCOM weapon systems. For example, microelectronic components were analyzed according to their availability and expected life cycle. To ascertain this information, UAH worked with the electronics industry, AMCOM project offices, and other government agencies. UAH also worked closely with the SEPD IOD systems engineer to resolve design problems as they arose. The specific results of these task efforts were published and delivered to IOD under separate cover.

#### **5.0 Conclusion and Recommendations**

During the time frame allocated by the delivery order, members of the UAH Systems Management and Production Lab, with the cooperation of representatives from the AMCOM Systems Engineering and Production Directorate and AMCOM project offices investigated the impacts of DMSMS on mechanical and microelectronic components of several AMCOM weapon systems. Because of the rapidly changing industrial technologies, it is imperative that this assessment be refreshed on a periodic

basis. Only through the diligent monitoring of a complex system can its sustainability issues be properly addressed. It is recommended that AMCOM project offices adopt a proactive DMSMS management philosophy so that the total cost of ownership is reduced over the system's life cycle.