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Contract No. DAAH01-01-C-R160  
Delivery Order No. 005b

**A Research and Analysis of AMCOM, RDEC, ED, Production Engineering Division  
and the Systems Engineering Effort  
(5-21776)**

Final Technical Report for Period  
6 June 2001 through 30 September 2001

February 2002

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## PREFACE

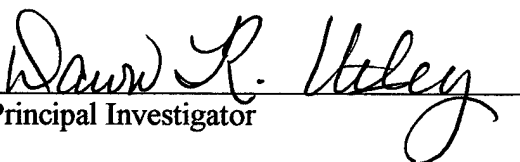
This technical report was prepared by the faculty of the Industrial and Systems Engineering and Engineering Management Department at the University of Alabama in Huntsville. The purpose of this report is to provide documentation of the work performed and results obtained under Delivery Order 005b of AMCOM Contract No. DAAH01-01-C-R160. Dr. Dawn R. Utley was the principal investigator. Ms. Patti Martin, Production Engineering Division, Engineering Directorate, Missile Research, Development and Engineering Center, provided technical guidance.

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

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

I have reviewed this report, dated February 2002, and the report contains no classified information.

  
Principal Investigator

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## **1.0 Introduction**

The Engineering Directorate (ED) of the Aviation and Missile Research Development and Engineering Center (AMRDEC) provides systems engineering support to AMCOM aviation and missile weapons system project offices. This systems engineering function includes the areas of quality and production engineering.

The Directorate has seen many changes over the past five years in the merging of Aviations and Missile Commands and mergers between groups within the Directorate. The Directorate provides support to its customers in the areas of systems, quality, reliability, and production. As such, expert and updated knowledge in these technical areas and in engineering management principles is needed to facilitate the understanding and dissemination of this knowledge for the successfully accomplishment of the Directorate's goals.

## **2.0 Objective**

The objective of this task is to provide expertise in the areas of strategic planning, systems engineering, and facilitating effective communication techniques. This task shall include aiding in the development of a strategic plan for the future of PE, assessing current capabilities and identifying future needs. Evaluation of the systems engineering effort within ED will be assessed according to established standards and procedures. And specific recommendations will be made.

## **3.0 Statement of Work**

The statement of work, as outlined in delivery order 005b, was as follows:

- 3.1 Strategic Planning. The contractor shall investigate background information to assess the current of the Directorate and specifically PE. Such things as mission and vision statements review, internal and external environment assessment, and future needs of customers and the supporting Directorate will be used to help establish a strategic plan for PE specifically. Interviews with key AMCOM personnel and a possible survey developed and administered to assess the skill level and mix within PE will be used as part of the assessment.
- 3.2 Systems Survey results from a previous endeavor will be used to map requirements to independent standards such as EAI and CMMI. Benchmarking of other government facilities offering similar support as ED along with the analysis mapping will be used to identify strengths and weaknesses within the Directorate Development of specific recommendations will result from this study.

- 3.3 Seminar meetings will be conducted for the purpose of sharing information with the employees of PE. This information is intended to be timely and could include training in effective engineering management principals such as communication techniques. It might also include summary and recommendations of improvement efforts within the Directorate.

#### **4.0 Conclusion and Recommendations**

During the time frame allocated by the delivery order, the researcher, with the cooperation of representatives from AMCOM Engineering Directorate, conducted research and analysis into the strengths and weaknesses of the Production Engineering Division (PED). Future customer opportunities were identified and competitor threats were assessed. The current strategic mission and vision was evaluated. As a result, a Skills Inventory List was generated to aid in developing a training/education program. This list would also be valuable for new employee orientation to be used to identify expertise and knowledge within PED.

A systems survey was developed with the help of key Systems Engineers within PED on a previous contract. The Carnegie-Mellon Capability Maturity Model Integration was loosely incorporated into the survey. The survey was distributed throughout PED and beyond to other organizations within ED that participated in the systems engineering mission. A formal report detailing the weaknesses and strengths of the systems engineering effort and where in the organization those strengths and weaknesses resided was developed and submitted. This included an assessment with respect to the CMMI.

A meeting was held as part of the staff meeting to disseminate information about the strategic endeavor and solícite suggestions and concerns. A breakfast meeting was held at which Dr. Componation from UAH gave a brief overview of Producibility Engineering. Other short informative seminars have been discussed and will be scheduled as soon as time within the division permits.

# Production Engineering Skills Inventory List

Name: \_\_\_\_\_

Please indicate your level of expertise with each of these concepts and tools, then indicate your formal training. The object is to evaluate current capabilities within PED and develop strategies for the future.

	Current Assessment				Have Had Formal Training
	None	Some Exposure	Moderate Experience	Very Proficient	

## Concepts

	None	Some Exposure	Moderate Experience	Very Proficient	Have Had Formal Training
1 Facility Design and Layout					
2 Producibility Engineering					
3 Design for Manufacturing					
4 Materials Science					
5 Risk Management					
6 Optimization					
7 Modeling and Simulation					
8 Project Management					
9 Project Scheduling					
10 Statement of Work Development					
11 Cost Analysis (Engineering Economy)					
12 Statistical Process Control					
13 Capability Maturity Model Standard					
14 ISO 9000 Standard					
15 Variability Reduction					
16 Writing Performance Specifications/Requirements					
17 Production Readiness Assessments					
18 Configuration Management					
19 Gov't Acquisition Process					
20 Gov't Contract Administration/Requirements					
21 Technical Readiness Assessment					
22 Understanding of PED Philosophy					
23 Business Process Reengineering					
24 Theory of Constraints					
25 Product Planning					
26 Process Planning					
27 Acquisition Strategy Development					

	Frequency of Use or Proficiency				Had Formal Training
	None	Some	Moderate	Very High	

## Self Management Skills

	None	Some	Moderate	Very High	Have Had Formal Training
28 Communication facilitator with customer					
29 Communication facilitator across divisions					
30 Communication facilitator across PED					
31 Understanding of capabilities within other divisions					
32 Time management					
33 Strategic view (futuristic vision)					
34 Organization skills (documenting accomplishments)					

	Frequency of Use or Proficiency				Had Formal Training
	None	Some	Moderate	Very High	
<b>Self Management Skills (cont.)</b>					
35 Leadership skills (experience as a team lead or manager)					
36 Marketing PED services					
37 Conflict resolution management					
38 Contract liaison					

	Current Assessment				Have Had Formal Training
	None	Some Exposure	Moderate Experience	Very Proficient	
<b>Tools</b>					
36 Quality Function Deployment					
37 Linear Programming					
38 Simplex method					
39 ARENA simulation package					
40 WITNESS simulation package					
41 PROMODEL simulation package					
42 CAD/CAM					
43 MICROSOFT PROJECT					
44 CPM					
45 PERT					
46 Trade off analysis					
47 Xbar and R charts					
48 n,p,c, and u charts					
49 Process capability					
50 Response Surface Modeling					
51 DoD guidelines in production engineering					
52 Life Cycle Analysis					
53 Flow Charts					
54 Affinity Diagrams					
55 Fault Tree Analysis					
56 Failure Modes and Effects Analysis					
57 Pareto Charts					
58 Ishikawa Diagram / Fishbone Diagram					
59 Matrix Diagram					
60 Relations Diagram					
61 Systematic Diagram					
62 Arrow Diagram					
63 Process Decision Program Chart					
64 MRP or MRP II					
65 Design of Experiments / Taguchi Methods					
66 DOORS or CORE					