

UAH

The University of Alabama in Huntsville

Research Administration

Huntsville, Alabama 35899
Phone: (205) 890-6000
Fax: (205) 890-6677

June 18, 1998

U.S. Army Aviation & Missile Command
AMSAM-RD-SE-PE
Attn: Mr. Dan Holder
Redstone Arsenal, AL 35898

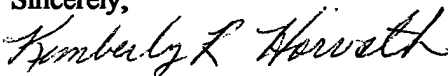
RE: Final Report
DAAH01-92-D-R006 D.O. 154

Dear Mr. Holder:

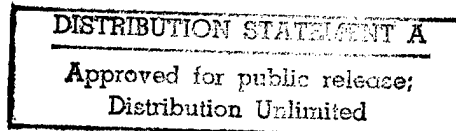
Please find enclosed one copy of the above noted **Final Report** for "Management and Operation of the Production Engineering Division Stereolithography (SL) Laboratory" as required by the above referenced contract.

If you have any questions or need additional information, please contact me at (256) 890-6000 ext. 224.

Sincerely,



Kimberly R. Horvath
Contract Assistant



ENC.

cc:	AMSAM-AC-RD-BB Bldg 5400 Rm B148/Judy Sutherland	(ltr/rpt)
	ONRRO	(ltr/rpt)
	DTIC/OCA	(ltr/2 rpt)
	UAH/Joe Paxton	(ltr)
	UAH/ Accounting	(ltr)
	UAH/File	(ltr/rpt)
	UAH/Archives	(rpt)

19980626 055

DTIC QUALITY INSPECTED 1

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 comment regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, 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 June 1998	3. REPORT TYPE AND DATES COVERED Final 16-Mar-98 - 30-Jun-98	
4. TITLE AND SUBTITLE Management and Operation of the Production Engineering Division Stereolithography (SL) Laboratory Final Report			5. FUNDING NUMBERS G: DAA H01-92-D-R006	
6. AUTHOR(S) Joe Paxton				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) University of Alabama in Huntsville 309 Sparkman Drive Huntsville AL 35899			8. PERFORMING ORGANIZATION REPORT NUMBER UAH CAR Report 98-03	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSORING / MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution unlimited.			12 b. DISTRIBUTION CODE Distribution Statement A	
13. ABSTRACT (Maximum 200 words) See Attached.				
14. SUBJECT TERMS Rapid Prototyping Stereolithography			15. NUMBER OF PAGES 15	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OR REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED	19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED	20. LIMITATION OF ABSTRACT UL	

ABSTRACT

The purpose of this report is to provide a summary of the tasks performed under contract DAAH01-92-D-R006, Delivery Order 154 between the US Army Aviation and Missile Command and the University of Alabama in Huntsville. UAH was responsible for managing and operating Stereolithography Lab for the Production Engineering Division. During the period of performance, several prototyping projects were executed for Production Engineering's customers, including the Structures Directorate, the Patriot Project Office and the Corporate Information Center. In addition, computer aided design models were created for various customers using Pro/Engineer.

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.



Authorized Signature/Date

Joseph Paxton
Print or Type Name

256-890-6243 x268
Telephone Number

UAH CAR Report 98-03

**Management and Operation of the
Production Engineering Division
Stereolithography (SL) Laboratory**

Final Report

Prepared for:
US Army Aviation and Missile Command
Missile Research, Development and Engineering Center
Systems Engineering and Production Directorate
Redstone Arsenal, AL 35898

Prepared by:
Joe Paxton
Center for Automation and Robotics
University of Alabama in Huntsville
Huntsville, AL 35899
(256) 890-6243 x208

June 1998

1.0 INTRODUCTION

The Production Engineering Division (PED), SEPD, MRDEC, AMCOM has the mission and function of providing rapid prototypes via SL to various AMCOM customers. The PED provides the following services to its customers: assistance in generating acceptable Computer Aided Design (CAD) files, delivering these files to the SL laboratory, building SL prototypes using both the ACES and QuickCast (QC) build styles, finishing prototypes to the customers specifications, and facilitating the investment casting of QC prototypes. The PED requires engineering support in performing these SL tasks.

The purpose of this paper is to provide a summary of the support provided by the University of Alabama in Huntsville (UAH) to PED under contract DAAH01-92-D-R006, Delivery Order 154.

2.0 OBJECTIVE

The purpose of the work performed under this task was to provide engineering support in producing SL prototypes for the PED customers.

3.0 WORKSITE

All work was performed at government facilities at Redstone Arsenal and at UAH.

4.0 SUPPORT

UAH was responsible for providing support to PED in several areas. The areas are:

- Assist PED customers in determining the applicability of CAD models to the SL process
- Assist PED customers in generating acceptable CAD files for use with the SL equipment and transferring these files to the SL equipment. This assistance covered a variety of CAD software packages, including the PED Pro/Engineer CAD software.
- Generate acceptable SL build files using Maestro and QuickCast software. This effort included part orientation, support generation, build style configuration, and build file generation.
- Build all SL prototypes using the PED SL equipment
- Finish all SL prototypes in accordance to standard SL procedures and customers specifications using PED SL equipment
- Finish all QC prototypes using standard SL QC procedures and facilitate investment casting of SL QC prototypes

- Support PED in the overall management of the SL laboratory. This effort included: scheduling of prototype builds, estimates of SL build time and prototype volume, maintaining SL production log book, maintenance of SL equipment and laboratory, facilitating vendor interaction, disposal of SL waste, monitoring and ordering of SL supplies and equipment, generation technical reports, and delivery of final products.

Customers for whom CAD models were generated and SL prototypes built include the Structures Directorate in RDEC, the Corporate Information Center (CIC) and the Patriot Project Office. Structures primarily requested QuickCast models for investment casting, while Patriot needed ACES models for fit testing. CIC uses the SL models as mine pattern masters for RTV molding and vacuum forming. They are eventually used as training aids for soldiers to recognize and handle mines.

5.0 FURTHER RESEARCH

Upon completion of the above tasks, several areas were found that need further research and support including: continuous improvement of marketing literature, further growth and support of the prototyping customer base and implementation of new technologies and processes related to stereolithography.

As new technologies develop and the capabilities of PED are enhanced, the marketing literature must be updated. This is required to keep the customers informed of new developments that will meet their ever-changing design and prototyping requirements.

It is expensive to operate a rapid prototyping laboratory. The rates charged for services are directly related to the number of projects that run through the lab. Therefore, the customer base must continuously grow and their needs supported to reduce the costs. Obvious reasons for reducing the costs are to save money and be more competitive with the customers' alternate sources for prototyping services.

For PED to remain on the leading edge of prototyping technologies, the processes and capabilities of the lab must be expanded to meet the needs of the customers. One example is to implement RTV molding. It has been noticed that several customers request multiple prototypes of the same design. RTV molding can provide replicates of SL prototypes at a fraction of the cost of building all the models.

Another method of remaining on the leading edge of rapid prototyping technologies is to network with other service bureaus and equipment providers. One of the most effective ways of doing this is to participate in conferences and user group meetings. Several events occur every year that would be beneficial to AMCOM to have a representative.

The areas of development described above complement each other. PED must continue to upgrade its capabilities to expand the customer base. The customers must be informed of these upgrades through the use of up-to-date marketing literature.