FEASIBILITY STUDY OF AUTOMATIC FABRICATION OF SPECTACLE LENSES IN THE FIELD

J. T. Celentano

Life Systems Research Institute

Prepared for:

Army Medical Research and Development Command

August 1969

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OF SPECTACLE LENSES IN THE FIELD

FIRST QUARTERLY PROGRESS REPORT

U.S. ARMY MEDICAL RESEARCH & DEVELOPMENT COMMAND
CONTRACT DADA17-69-C-9062

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LIFE SYSTEMS RESEARCH INSTITUTE AND
UNIVIS®
Feasibility Study of Automatic Fabrication of Spectacle Lenses in the Field

Quarterly Progress Report, 14 April - 13 July 1969

J. T. Celentano, M.D.

August 1969

DADA17-69-C-9062

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US Army Medical Research and Development Command, Washington, DC 20314

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- Lens fabrication
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LIFE SYSTEMS RESEARCH INSTITUTE
LOS ANGELES, CALIFORNIA

AND

UNIVIS, INCORPORATED
FORT LAUDERDALE, FLORIDA

AUGUST 1969
FOREWORD

This is the first informal quarterly report for a Feasibility Study of Automatic Fabrication of Spectacle Lenses in the Field submitted by Life Systems Research Institute and Univis, Incorporated to the U. S. Army Medical Research and Development Command in accordance with Item E. (1) of Contract DADA17-69-C-9062, 14 April 1969.

The work was performed during the period 14 April to 13 July 1969 at the Life Systems Research Institute offices in Los Angeles, the Univis research and development laboratories in Fort Lauderdale, and the Univis Applied Plastics Division in New York. Dr. J. T. Celentano is Principal Investigator and Project Manager for the study. Mr. M. O. Rudd is Principal Investigator for Univis and Mr. M. Greshes is Associate Principal Investigator for the Applied Plastics Division of Univis.

This report was prepared by Dr. J. T. Celentano.
ABSTRACT

This report is the first informal quarterly report of a Feasibility Study of Automatic Fabrication of Spectacle Lenses in the Field, U. S. Army Medical Research and Development Command Contract DADA17-69-C-9062, 14 April 1969.

The work accomplished during the period 14 April through 13 July 1969 was in accordance with Task 1.0 Review State-of-the-Art and Task 2.0 Systems Analysis of the Schedule of Work.

The review of the state-of-the-art concerned lens fabrication techniques, materials applicable to automatic lens fabrication, and automated fabrication techniques. Over 500 suppliers of plastic materials and other products, optical and ophthalmic products, automated optical equipment, and automated plastic fabricating equipment were contacted by letter. Follow-up letters were sent when items of extreme interest were uncovered or when no reply was forthcoming. A number of these suppliers were visited personally by either the Life Systems Research Institute or Univis representatives. A literature survey was begun, searching for articles related to plastic lenses, ophthalmic and optical techniques and products, automated lens fabrication techniques, and plastic automated fabrication techniques. A preliminary evaluation of the material was begun. Preliminary analysis of Army field operations related to optical laboratories was initiated as well as the definition of requirements for the combat soldier. In addition, analysis of existing lens and spectacle manufacturing technology, both for plastic and glass ophthalmic lenses, was also started.
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INTRODUCTION

This is the first informal quarterly report of a Feasibility Study of Automatic Fabrication of Spectacle Lenses in the Field. The work during this period of time was primarily devoted to Task 1.0 Review State-of-the-Art and Task 2.0 Systems Analysis.

These progress reports are provided primarily to indicate the nature of the effort expended during the particular quarter reported upon. They are primarily administrative in nature. According to the proposed schedule of work there will be a major technical report prepared and submitted at the end of each task as well as the final report.

As the title of the project implies, this is a feasibility study devoted to the determination of the capability of existing engineering technology to provide a device or system which will automatically fabricate spectacle lenses in the field. The purpose of the project is not only to determine if such a development is feasible but, if feasible, to develop the preliminary design.

As with any highly specialized technical field, the initial impulse is to jump into the middle of engineering design. This has been diligently resisted as it is recognized that the key to a successful and detailed feasibility study will be the initial surveys and analyses accomplished prior to an in-depth consideration of any one design. The rationale being that proven processes and technologies may already exist that can provide in a most cost-effective manner the desired system. New developments may also be occurring in the vast resources of industrial technology that may provide the most optimal solution; which developments would be missed without an adequate survey of the industry. In addition, resources for research and development into specific areas can most reasonably be identified.

In view of this, the first quarterly progress report is provided to indicate, briefly, the accomplishments of the first quarter, some of the problems encountered, and the direction that the project will take during the ensuing quarter.
TECHNICAL MEETINGS

A preliminary meeting was held at the Medical R&D Command on 22 April 1969. Those in attendance were: Col. J. P. McCaffrey, Director - Development Directorate; Mr. J. R. Beall, Chief - Biomedical Division; Col. M. T. Guibor, Chief - Purchasing and Contracting Office; Mrs. J. V. Egan, Contract Administrator; Col. B. Appleton, MC, Technical Advisor; Col. B. C. Green, Technical Advisor; Mr. M. O. Rudd and Mr. M. Greshes of Univis, Inc.; and Dr. J. T. Celentano of Life Systems Research Institute. The purposes of this meeting were to assure early guidance and agreement as to the technical approach, and to assist in making decisions regarding policy.

A number of characteristics regarding design criteria for the lens fabrication system were discussed. In general, it was the consensus that the feasibility study should begin with very broad criteria so as not to limit too early design concepts. It was recognized that as a result of the study preliminary design criteria might be considerably narrowed depending upon existing technology and the limitations thereof. The characteristics discussed and some of the comments in the form of guidelines are enumerated in what follows:

1. Protection. Protection is of great concern to military ophthalmologists and in fact it is the opinion of many that all combat troops should wear protective glasses whether in need of correction or not.

2. Weight. The weight of the spectacles should be as light as possible. This, of course, is one of the advantages of plastic materials.

3. Scratch-Resistance. The spectacles should be as scratch-resistant as possible. This is recognized as one of the great drawbacks of plastic for ophthalmic lenses.

4. Style. Wearer acceptability is an important consideration. If the automatic lens fabrication system is applicable only to the combat zone, this may not be as much of a problem as if a universal system is developed. It is important to determine the effect upon feasibility of providing a variety of styles of lenses and frames.
5. Prescription Exactness. Classical optometric requirements demand prescriptions to be within + 1/8 Diopter, i.e., fit to within 1/4 Diopter. One of the criteria to be examined in depth as part of the feasibility study will be the actual prescription tolerance requirement for the soldier. For example, it may be desirable and practical to provide prescriptions to + 1/4 Diopter, thus requiring only 1/2 Diopter steps. In addition, the tolerances required by the soldier in a combat zone should be determined versus the tolerances required by the Army population at large. If each lens were considered to be a crossed cylinder with the widest tolerance of + 1/2 Diopter, adequate prescription coverage for the combat situation may be possible. In this case the emphasis would be on overcorrection. It is not to be construed from the above that a wider tolerance is acceptable, but that this may be one of the compromises that have to be taken.

6. Size of Automatic Lens Fabrication System. Recognizing that it is desirable to have a system that can be carried by a 1/4-ton trailer, the results of the feasibility study may show that a larger vehicle is required and 3/4-ton or 1-1/2-ton trailers should not be excluded.

7. Prescription Limits. At least for initial evaluations all vision capabilities should be considered, i.e., there should be no limit on the maximum prescription that can be provided by the automatic lens fabrication system. It is understood that this requirement may have to be narrowed due to the results of the feasibility study.

8. Skill Level. According to the requirements of the RFP, and as part of the basis for the RFP, the skill level required to operate the automatic lens fabrication system should be considerably less than that required of an optical technician.

9. Frames. It is desirable to have the frames and lenses combined in some way if possible, either through a single process of the system or an additional process after the lenses are made.

10. Shape. It was noted by the technical advisors that there are seven standard spectacle lens shapes as used in industrial applications, although in actuality there are a very large number of shapes on the civilian market today. Initially the possibility of having at least seven shapes in the automatic lens
fabrication system should be evaluated. This may be narrowed depending upon the results of the feasibility study and the particular application of the lens. For example, a spectacle to be used only in a combat area may have little requirement for cosmetic appearance as opposed to spectacles to be used universally throughout the Army.

11. Tint. Army spectacle lenses today are tinted. Army aviation lenses have G-15 tints and infantry lenses are G-33. The infantry lenses have less color and more U-V transmissions than the aviation lenses. The feasibility study should be concerned with lenses for Army aviators as well as ground combat personnel.

12. Photochemically Active Lenses. While the concept is desirable for a lens that may darken with exposure to bright light, those developed to date have a very poor return response. Photochemically active lens substances should be examined looking for new developments in the field.
With the initiation of the contract, the review of the state-of-the-art was begun and continued through the first quarter. Initially, the review consisted of extending the literature search from seventy review articles identified during the proposal. The procedure that has been developed involves a number of steps. An evaluation of a large number of abstract indexes were conducted and five were selected for in-depth survey. They are the Engineering Index, the Index Medicus, the Index of Science and Technology, Plastic Abstracts, and Reader's Guide to Periodical Literature. These indexes are then searched for key categories such as spectacles, spectacle lenses, lenses, optics, ophthalmics, plastic lenses, automatic processes, lens processes, etc. Reprints of articles whose abstracts appear appropriate are secured. Each article is then thoroughly evaluated and appropriate material summarized for the survey report. In addition, the references or bibliography of each article is reviewed for leads to other articles not picked up in the index search. Additionally, a complete search of the U. S. Patents is being conducted. By the end of the quarter approximately 40 percent of the search was completed. Appendix I is a list of additional references.

In order to evaluate the state-of-the-art of the ophthalmic and plastics industry a list of suppliers and manufacturers of plastic and ophthalmic materials and processes was compiled. This list, provided as Appendix II, consists of 507 companies. The major ophthalmic suppliers are readily identifiable and did not represent a problem. However, the plastics industry is another matter. There are over a thousand suppliers of products in this area. Fortunately, there is some degree of categorization among these industries and the following criteria were established as a basis for determining which companies ought to be contacted:

1. Companies manufacturing resins, molding compounds and other plastic materials were identified, specifically those whose products include basic resins, casting resins or compounds, laminated resins or compounds, and molding or extruding compounds—companies whose only products are organosols and plastisols, fine powders, solutions and emulsions, and electrical specialty compounds were not included.

2. Foam plastics were not included because of their non-transparent properties.

3. Companies specializing in modifiers and additives were searched for those producing stabilizers or ultraviolet absorbers.
4. Film and sheeting manufacturers and those making fabrics, papers, and fillers only were not included because these products are not applicable to optical use; however, by and large, the major companies in this area are also specialized in resins and other basic plastics.

5. Manufacturers and suppliers of laminates and reinforced plastics only were not included as these also are not applicable to optical use.

6. Those companies involved in plastics machinery or equipment whose products include injection molding machines, molds and dies, compression molds, thermoforming systems, thermostet molding machines, and those manufacturing optical instruments were identified.

7. Companies specializing in dip-coating processes were included.

8. From an initial review of plastic properties the plastics of interest were narrowed to the following and companies producing these were included--acrylic, allyl resins and monomers, cellulosic molding compounds and sheets, cellulosics, epoxy resins, fluoroplastics, nylons, phenol-formaldehydes and phenol-furfural molding compounds, phenolic cast resins, phenoxy, polycarbonates, polyesters and alkyd resins, polyethylene, polypropylene, polystyrene silicons, urethanes, vinyl polymers and copolymers. All these generic plastics include one or several transparent products. The other generic plastics do not include a transparent product.

A series of basic letters were prepared for several categories of companies: plastics manufacturers who may have a product of optical quality; plastics manufacturers or processors who may have a product or technique that could be used for ophthalmic lens manufacturing; automatic machine processors who may have techniques or equipment that could be used for lens manufacturing and processing; and ophthalmic lens producers and processors. Sample letters are included as Appendix III. Since the leaders in plastic technology have a variety of products and processes, the contacts that were made in the categories identified provide a thorough examination of the plastics and ophthalmic industries both in breadth and in depth. One of the letters, selected on the basis of each supplier's major capability, was mailed to all 507 suppliers. Through the first quarter approximately 40 percent return on the letters was received. Where no return occurred an additional letter contact was made or, in some cases, telephone contact was made. Those suppliers having especially interesting processes and techniques were requested to allow a visit by a representative of the project team.

During the latter part of the quarter preparations were made for a visit to the Applied Plastics Division of Univis, Inc. by Col. McCaffrey, Mr. Beall, Col. Appleton, and Col. Green for a demonstration of some initial concepts for rapid plastic lens fabrication.
TASK 2.0 SYSTEMS ANALYSIS

During the third month of the contract this task was initiated. During this period the primary effort was devoted to reviewing military publications bearing upon Army field operations in relation to the optical laboratory and the potential for automatic fabrication of spectacle lenses. In addition, the development of requirements for spectacles in terms of personnel needs and combat conditions was begun. The latter effort has been devoted to a realistic determination of the actual needs of the soldier for prescription accuracy, especially the combat soldier. For example, the current optical laboratory carries over 700 different prescription types. If, as has been suggested, a tolerance of $\pm \frac{1}{4}$ Diopter is used, the total number of prescription requirements will be markedly reduced. In addition, if the extreme prescriptions are eliminated on the basis of the probability of these being required, the prescription numbers can further be reduced. This is not to intimate that the automatic lens fabrication system will not ultimately be designed for all conceivable prescriptions, but that the ensuing trade-offs may show that by delimiting prescription requirements a much more sophisticated end-product may be practicable in the early stage of development.

During the first quarter the technology analysis was begun in two areas. First, the analysis of existing glass lens processing techniques has been examined in great detail. Some of this material will be presented as part of the survey of the state-of-the-art. Secondly, some approaches to plastic lens fabrication are being evaluated in great depth. New information being identified and evaluated indicate that probably the least part of the problem will be materials. Rather, the automated technique and mold requirements will be the most significant problems to be solved.
PROBLEMS AND PLANS

The major problem experienced during this quarter has been the slowness of the response of the suppliers to initial and secondary contacts. In many instances it has been necessary to follow-up with a telephone contact. Suppliers of whom a visit request was made have also been slow in responding, although visits are now averaging two or more a week. Because the lag time is primarily due to the response of the suppliers, it served no purpose to have additional personnel working simultaneously on this task. It is more important to more effectively complete this task by conserving effort during the early portion so that more senior personnel can evaluate the results of the survey. To this end, then, it is necessary to extend completion of Task 1.0 by one month. It is not anticipated that this will have any effect on the performance, cost, or overall schedule of the project.

On the basis of the survey to date it appears that materials may not be the problem, with one exception. While thermal plastic materials have not undergone great technical growth in the past five years, there has been considerable technical development of thermosetting materials. These now appear to show the greatest promise for desirable qualities and fast processing. The problem of abrasion resistance is still, however, a significant problem and it may well be that some form of coating will be required.

Possibly the most pressing problem will be that of automatic processing and multiple mold requirements versus lightweight and speed. This is being examined in great detail and solutions sought prior to preliminary design initiation.

During the second quarter the survey is to be completed as well as the system analysis. In addition, the Task 3.0 Preliminary Design will be initiated. A large number of visits to manufacturers and suppliers having processes and techniques of interest will be made during the early part of the second quarter.
COST AND SCHEDULE

During the proposal and initial contract period the effort to be expended was planned by task. Since that time re-evaluation of the effort distribution has been made, primarily with respect to the amount of time that would be devoted to the project by senior personnel.

In accordance with discussions with Col. J. P. McCaffrey, Col. M. T. Guibor, and Mrs. J. V. Egan, Task 4.0 Cost Effectiveness Evaluation will be considerably reduced in effort and scope and the difference applied to other tasks.

As mentioned earlier the costs incurred to date have been somewhat below the average anticipated due to the smaller effort on Task 1.0 Review State-of-the-Art during the first two months. The rate will, however, increase and actual costs will approach the planned costs during the second and third quarters. Figure 1 shows the accumulated actual costs and the estimated costs.

As discussed in the preceding section, it is necessary to extend the completion of Task 1 by one month. An updated schedule is presented in Figure 2.
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Figure 2. Project Schedule
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<td>Archer Daniels Midland Co. 733 Marquette Avenue, Minneapolis, Minn. 55440</td>
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<td>Adhesive Engineering Co.</td>
<td>1411 Industrial Road, San Carlos, California 94070</td>
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<td>Advance Division</td>
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<td>Air Reduction Co., Inc.</td>
<td>150 E. 42nd Street, New York, New York 10018</td>
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<td>Airam, Incorporated</td>
<td>7832 Balboa Boulevard, Van Nuys, California 91406</td>
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<td>Air Reduction Co., Inc.</td>
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<td>Akron Presform Mold Co.</td>
<td>2038 Main Street, Cuyahoga Falls, Ohio 44221</td>
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<td>Akron Plastics Corporation</td>
<td>35 Pequot Street, Canton, Mass. 02021</td>
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<td>Alcolac Chemical Corporation</td>
<td>3440 Fairfield Road, Baltimore, Md. 21226</td>
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<td>Alliance Mold Co., Inc.</td>
<td>1300 Mt. Read Blvd., Rochester, New York 14606</td>
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<td>Allied Chemical Corporation</td>
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Atlas Hydraulics, Inc.  
3576 Ruth Street  
Philadelphia, Pa. 19134

Baker Brothers, Inc.  
P. O. Box 101, Sta. "F"  
Toledo, Ohio 43610

The Electric Storage Battery Co.  
151 Ash Street  
Mertztown, Pa. 19539

Baker Castor Oil Co.  
40 Avenue "A"  
Bayonne, New Jersey 07002

Atlas Plastics, Inc.  
681 Seneca Street  
Buffalo, New York 14210

Baker, J. T., Chemical Co.  
N. Broad Street  
Phillipsburg, New Jersey 08865

Atlas Vac-Machine Division  
Koehler-Dayton, Incorporated  
401 Leo Street  
Dayton, Ohio 45404

Battenfield Corp. of America  
7301 N. Monticello Avenue  
Skokie, Illinois 60076

Atols Tool & Mold Corporation  
3828 N. River Road  
Schiller Park, Illinois 60176

Bausch & Lomb, Incorporated  
635 St. Paul Street  
Rochester, New York 14602

Auburn Plastics, Incorporated  
Auburn, New York 13021

Beacon Die-Mold, Inc.  
57 Crooks Avenue  
Clifton, New Jersey 07011

Auto-Vac Company  
Division of Plast-O-Craft, Inc.  
391 Mulberry Street  
Newark, New Jersey 07102

Bean Fiber Glass, Inc.  
59 Peterboro Street  
Jaffrey, New Hampshire 03452

Avisun Corporation  
21 S. Twelfth Street  
Philadelphia, Pa. 19107

Becker & van Heullen  
Niederrheinische Maschinenfabrik  
Untergath 100  
Kreteld, Germany

Axel Plastics Research Laboratories, Incorporated  
41-14 29th Street  
Long Island City, New York 11101

Beckman Instruments, Inc.  
2500 Harbor Boulevard  
Fullerton, California 92634

Bacon Industries, Inc.  
192 Pleasant Street  
Watertown, Mass. 02172

Belding Chemical Industries  
1407 Broadway  
New York, New York 10018

Badische Analin & Soda Fabrik AG  
67 Ludwigshafen  
Rhein, Germany

Beloit Eastern Corporation  
Plastic Machinery Division  
Washington & Greene Streets  
Downington, Pa. 19335

Baird Dynamic Co.  
Division of Searchway, Inc.  
686 Bostwick Avenue  
Bridgeport, Conn. 06605

Benson Optical Co.  
Medical Arts Building  
825 Nicollet Avenue  
Minneapolis, Minn. 55402
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<th>Company Name</th>
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<td>Bermer Tool &amp; Die, Inc.</td>
<td>Colt Street</td>
<td>Southbridge, Mass. 01550</td>
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<td>Berton Plastics, Inc.</td>
<td>170 Wesley Street S. Hackensack, N. J.</td>
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<td>4305 Oneida Street</td>
<td>Denver, Colorado 80216</td>
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<td>1547 - 14th Street Santa Monica, Calif. 90404</td>
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<td>Bipel International, Inc.</td>
<td>22 Numege Drive Trumbull, Conn. 06611</td>
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<td>Bishop Mfg. Corporation</td>
<td>10 Canfield Road Cedar Grove, N. J. 07009</td>
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<td>45 E. Bradrock Drive Des Plaines, Ill. 60016</td>
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<td>172 S. Portland Avenue Brooklyn, N. Y. 11217</td>
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<td>750 Canal Street Stamford, Conn. 06902</td>
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<td>350 Madison Avenue New York, New York 10017</td>
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<td>130 E. Randolph Drive Chicago, Illinois 60601</td>
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<td>Popes Lane Oldbury, Birmingham, England</td>
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<td>556 Morris Avenue Summit, New Jersey 07901</td>
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<td>Canadian Industries, Ltd.</td>
<td>630 Dorchester Boulevard W. Montreal, Que., Canada</td>
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<td>Cardinal Chemical Company RFD 4, P. O. Box 779 Columbia, S. C. 45239</td>
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<td>Carlisle Chemical Works, Inc. West Street Reading, Ohio 45215</td>
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<td>Carson Tool &amp; Mold Company 431 S. Four Lane Highway Marietta, Georgia 30062</td>
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<td>Carver, Fred S., Inc.</td>
<td>5 Chatham Road Summit, New Jersey 07901</td>
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<td>Celanese Coatings Company Resins &amp; Chemicals Division 224 E. Broadway Louisville, Kentucky 40201</td>
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<td>Celanese Plastics Company 550 Broad Street Newark, New Jersey 07102</td>
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<td>Cosden Oil &amp; Chemical Co.</td>
<td>P. O. Box 1331 Big Springs, Texas 79720</td>
<td>Danley Machine Specialties, Inc. 2100 S. Laramie Avenue Chicago, Illinois 60650</td>
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<td>Cosmic Plastics, Inc.</td>
<td>12314 Gladstone Avenue San Francisco, California</td>
<td>Delta Molds, Inc. 1021 Paulison Street Clifton, New Jersey 07011</td>
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<td>Cosmosplastics, s. r. l.</td>
<td>Galleria Buenos Aires 11 Milano, Italy</td>
<td>Dennis Chemical Co. 2701 Papin Street St. Louis, Mo. 63103</td>
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<td>Covema, s. r. l.</td>
<td>Via Fontano 1 Milan, Italy</td>
<td>Design Center, Incorporated 5-26 46th Avenue Long Island City, New York 11101</td>
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<td>Coz Chemical Corp.</td>
<td>Providence Road Northbridge, Mass.</td>
<td>Devco. Corporation Endicott Street Danvers, Massachusetts 01923</td>
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<td>150 E. 42nd Street New York, New York 10017</td>
<td>Di-Acro Division of Houdaille Industries, Inc. 578 Eighth Avenue Lake City, Minnesota 55041</td>
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<td>Cuming, M. A., Co.</td>
<td>49 Bleecker Street New York, New York 10012</td>
<td>Diamond Shamrock Company 300 Union Commerce Building Cleveland, Ohio 44115</td>
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<td>Cylke's Injection Mold Co. Route 1, Canton Highway Woodstock, Ga. 30188</td>
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<td>Diemolding Corporation 125 Basbach Street Canastota, New York</td>
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<td>D-M-E Corporation</td>
<td>6686 E. McNichols Road Detroit, Michigan 48212</td>
<td>Dolph, John C., Company New Road Monmouth Junction, N. J. 08852</td>
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<td>Dake Corporation</td>
<td>641 Robbins Road Grand Haven, Michigan 49417</td>
<td>Dow Chemical Company Midland, Michigan 48640</td>
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<td>P. O. Box 422 Union, New Jersey 07083</td>
<td>Dow Corning Corporation S. Saginaw Road Midland, Michigan 48640</td>
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<td>Du Pont de Nemours, E. I. &amp; Co., Inc.</td>
<td>1007 Market Street Wilmington, Delaware 19898</td>
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<td>Dusal Tool &amp; Mold Co., Inc., 130 Finn Court, Farmingdale, N. Y. 11735</td>
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<td>Easco-Sparcatron, Inc.</td>
<td>100 Morgan Road, Ann Arbor, Michigan 48104</td>
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<td>417 Main Street, Little Falls, New Jersey 07424</td>
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<td>9314 Elizabeth Avenue, Cleveland, Ohio 44105</td>
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<td>600 Fisher Street, Franklin, Mass. 02038</td>
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<td>140 Enterprise Avenue, Trenton, New Jersey 08602</td>
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<td>Electronic Products Div., 11 S. Irvine Street, Warren, Pa. 16365</td>
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<td>1428 N. Tyler Avenue, S. El Monte, Calif. 91733</td>
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<td>953 E. Twelfth Street, Erie, Pa. 16512</td>
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<td>539 E. Troy Avenue, Indianapolis, Indiana 46203</td>
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<td>205 E. 42nd Street</td>
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<td>FARREL CORPORATION PLASTICS MOLDING MACHINERY DIV.</td>
<td>656 Blossom Road</td>
<td>Rochester, NY 14610</td>
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<td>Fellows Gear Shaper Company</td>
<td>78 River Street</td>
<td>Springfield, VT 05156</td>
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<td>Fenwall, Inc.</td>
<td>400 Main Street</td>
<td>Ashland, MA 01721</td>
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<td>Ferracute Machine Co.</td>
<td>E. Commerce St.</td>
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<td>Ferro Corporation</td>
<td>Cordo Division</td>
<td>Norwalk, CT 06852</td>
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<td>Ferro Corporation</td>
<td>Ferro Chemical Division</td>
<td>Bedford, OH 44014</td>
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<td>FIBERFIL, INC.</td>
<td>1701 N. Heidelbach Ave.</td>
<td>Evansville, IN 47717</td>
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<td>Fiberite Corporation</td>
<td>513 W. Fourth Street</td>
<td>Winona, MN 55987</td>
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<td>Firestone Plastics Co. Div. Firestone Tire &amp; Rubber Co.</td>
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<td>Firestone Plastics Co. P. O. Box 699</td>
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<td>Fjellman American, Inc.</td>
<td>105 Republic Avenue</td>
<td>Joliet, IL 60435</td>
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<td>Flexible Products Company</td>
<td>P. O. Box 996</td>
<td>Marietta, GA 30060</td>
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<td>527 Avenue &quot;P&quot;</td>
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<td>Fluorocarbon Company</td>
<td>1754 S. Clementine Street</td>
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<td>Ford Motor Company</td>
<td>Paint &amp; Chemical Products Plant</td>
<td>Mount Clemens, MI 48044</td>
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<td>France Campbell &amp; Darling, Inc.</td>
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<td>Franklin Fibre-Lamitex Corp.</td>
<td>903 E. 13th Street</td>
<td>Wilmington, DE 19899</td>
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<td>Freeman Chemical Corporation Division, H. H. Robertson Co.</td>
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<td>French Oil Mill Machinery Co.</td>
<td>1035 W. Greene Street</td>
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<td>4516 Brazil Street</td>
<td>Los Angeles, CA 90039</td>
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<td>270 Lincoln Boulevard</td>
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<td>Future Chemicals Group of Mfg. Cos.</td>
<td>2849 Montrose Avenue</td>
<td>Chicago, IL 60614</td>
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<td>G. B. F. Costruzioni Meccaniche S.p.a.</td>
<td>Via Vittorio Veneto 12, Bresso</td>
<td>Milano, IT 20133</td>
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<td>Company</td>
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<td>Glastic Corporation</td>
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<td>Garfield, New Jersey 07026</td>
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<td>Saw Mill River Road</td>
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<td>General Aniline &amp; Film Corp.</td>
<td>140 W. 51st Street</td>
<td>New York, N. Y. 10020</td>
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<td>Bloomfield, New Jersey 07003</td>
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<td>5200 N. Second Street</td>
<td>St. Louis, Mo. 63147</td>
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<td>Goodrich, B. F., Chemical Co.</td>
<td>3135 Euclid Avenue</td>
<td>Cleveland, Ohio 44115</td>
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<td>Akron, Ohio 44316</td>
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<td>Chicago, Illinois 60607</td>
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<td>Mt. Gilead, Ohio 43338</td>
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<td>Worcester, Mass. 01603</td>
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<td>Hardman, H. V., Co., Inc.</td>
<td>575 Cortlandt Street</td>
<td>Belleville, New Jersey 07109</td>
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<td>910 Market Street, Wilmington, Delaware 19899</td>
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<td>Hoover Ball &amp; Bearing Co.</td>
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<td>House of Vision</td>
<td>135 North Wabash, Chicago, Ill. 60602</td>
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<td>Houston Plastic Products, Inc.</td>
<td>13026 Rosecrest Street, Houston, Texas 77035</td>
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<td>Hull Corporation</td>
<td>5001 Davisville Road, Hatboro, Pennsylvania 19040</td>
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<td>200 Bentworth Avenue, Toronto 19, Ontario, Canada</td>
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<td>Hysol Corporation</td>
<td>1100 Seneca Avenue, Olean, New York 14761</td>
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<td>ICI - Organics, Inc.</td>
<td>55 Canal Street, Providence, Rhode Island 02901</td>
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<td>Imperial Chemical &amp; Plastics Corp.</td>
<td>Mill Street, Cranston, Rhode Island 02905</td>
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<td>Improved Machinery, Inc.</td>
<td>150 Burke Street, Nashua, New Hampshire 03060</td>
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<td>Industrial Coatings Company</td>
<td>Derry Court, RFD 5, York, Pennsylvania 17402</td>
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<td>703 Washington Street, S. Easton, Mass. 02375</td>
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<td>Industrial Vinyls, Inc.</td>
<td>3310 NW 30th Street, Miami, Florida 33152</td>
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<td>Instrument Development Laboratories</td>
<td>67 Mechanic Street, Attleboro, Mass. 02703</td>
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<td>Interchemical Corp.</td>
<td>Finishes Division 1255 Broad Street, Clifton, New Jersey 07015</td>
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<td>International Coatings Co.</td>
<td>1441 W. El Segundo Blvd, Compton, California 90222</td>
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Liberty Engineering & Mfg. Co. Maclin Company
1417 W. Ormsby Avenue 67-6800 Stanford Avenue
Louisville, Kentucky Los Angeles, California 90001

Liberty Mold & Duplicating Co. Madison Plastic & Mold Co., Inc.
80 Faden Road 245 Gotzian Road
Springfield, New Jersey 07081 Madison College, Tenn.

Liberty Optical Manufacturing Co., Inc Magnolia Plastics, Inc.
380 Verona Avenue 5547 Peachtree Industrial Blvd.
Newark, New Jersey 07104 Chamblee, Georgia 30005

Lite-Kote Plastic Corp. Mallinkrodt Chemical Works
4488 W. 160th St. & Puritas Ave. 3200 N. Second Street
Cleveland, Ohio 44135 St. Louis, Mo. 63160

Liquid Nitrogen Processing Corp. Manco Products, Inc.
415 King Street 2401 Schaefer Road
Malvern, Pa. 19355 Melvindale, Michigan 48122

Logan Engineering Co. Many, J., & Company
Hydraulics Division 153 Lafayette Street
4901 W. Lawrence Avenue New York, New York 10013
Chicago, Ill. 60630

Lombard Industries, Inc. Marblette Corp., The
300 Main Street 37-31 30th Street
Ashland, Mass. 01721 Long Island City, New York 11101

Lorben Corporation Marbon Chemical Division
3333 Lawson Boulevard Borg-Warner Corporation
Oceanside, New York 11572 P. O. Box 68

J & H Building Marco Chemical Division
Olean, New York W. R. Grace & Company

Luzerne Rubber Company 1711 W. Elizabeth Avenue
Subsidiary, Beisinger Industries, Ltd. Lindon, New Jersey
Marine Optical Manufacturing Co.
Muirhead Street 28 Mahler
Trenton, New Jersey 08607 Jamaica Plains, Mass. 02130

M & N Modern Hydraulic Press Co., Inc. Marks Polaroid Corporation
P. O. Box 504 Whitestone, Station
Clifton, New Jersey 07012 Flushing, New York 11357

M & T Chemicals, Inc. Marland Mold Co., Inc.
Woodbridge Avenue Subsidiary, Greylock Plastics, Inc.
Rahway, New Jersey 07065 125 Pecks Road

Melamine Plastics, Inc.
Division of Fiberite Corporation
512-23 W. Fourth Street
Winona, Minnesota 55987

Merix Chemical Company
2234 E. 75th Street
Chicago, Illinois 60649

Metachem Resins Corporation
Mereco Products Corp. Div.
539 Wellington Avenue
Cranston, R. I. 02910

Metrolead Products Corporation
2901 Park Boulevard
Palo Alto, California 94306

Middlesex Tool & Machine Co.
1157 Globe Avenue
Mountainside, New Jersey 07092

Midland Die & Engraving Co.
302 Factory Road
Addison, Illinois

Miles, A. L., Fiberglass & Plastic Supply
4060 Wyne Street
Houston, Texas 77017

Miller-Stephenson Chemical Co., Inc.
16 Sugar Hollow Road
Danbury, Conn. 06813

Millmaster Onyx Corporation
99 Park Avenue
New York, New York 10016

Minnesota Mining & Mfg. Co.
2501 Hudson Road
St. Paul, Minnesota 55119

Mitchell Rand Mfg. Corp.
Torne Valley Road
Hillburn, N. Y. 10931

Mitsubishi Rayon Co., Ltd.
8, 2-chome, Kyobashi,
Chu-ku-Tokyo, Japan

Mobay Chemical Co.
Penn Lincoln Pkwy, W.
Pittsburgh, Pa. 15205

Modern Tool & Die Co., Inc.
125 Tolman Avenue
Leominster, Mass. 01453

Mol-Rez Division
American Petrochemical Corp.
3134 California Street NE
Minneapolis, Minnesota 55418

Monsanto Company
800 N. Lindbergh Boulevard
St. Louis, Mo. 63166

Moore Chemical Corp.
Whitehorn Way & Kemp Road
Burlingame, California 94010

Morton Chemical Co.
110 N. Wacker Drive
Chicago, Illinois 60606

Moslo Machinery Company
20120 Detroit Road
Cleveland, Ohio 44116

Munray Products Division
Fanner Manufacturing Company

National Coating, Inc.
P. O. Box 223
W. Hanover, Mass. 02380

National Lead Company
111 Broadway
New York, New York 10006
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<td>National Polychemicals, Inc.</td>
<td>Eames Street, Wilmington, Mass. 01887</td>
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<td>National Starch &amp; Chemical Corp.</td>
<td>750 Third Avenue, New York, New York 10017</td>
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<td>National Tool &amp; Mfg. Co.</td>
<td>100 N. Twelfth Street, Kenilworth, N. J. 07033</td>
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<td>National Vacuum Platers, Inc.</td>
<td>2635 E. Hagert Street, Philadelphia, Pa. 19125</td>
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<td>New Britain Machine Co.</td>
<td>307 South Street, New Britain, Conn. 06050</td>
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<td>New England Butt Company</td>
<td>Division, Wanskuck Company 304 Pearl Street, Providence, Rhode Island</td>
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<td>Newark Die Company</td>
<td>24 Scott Street, Newark, New Jersey</td>
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<td>Newbury Industries, Inc.</td>
<td>10975 Kinsman Road, Newbury, Ohio 44065</td>
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<td>Nissei Plastics Industrial Co. Ltd.</td>
<td>Sakaki, Hanishina, Nagano-Ken, Japan</td>
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<td>Nonweiler, A. P., Co.</td>
<td>P. O. Box 1007, Oshkosh, Wisconsin 54902</td>
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<td>Nopco Chemical Company</td>
<td>60 Park Place, Newark, New Jersey 07102</td>
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<td>Nordberg Mfg. Company</td>
<td>Hydraulic Press Division, 3073 S. Chase Avenue</td>
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<td>North American Machinery Corp.</td>
<td>60 E. 42nd Street, New York, New York 10017</td>
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<td>North East Chemical Corp.</td>
<td>24 Union Hill Road, W., Conshohocken, Pennsylvania</td>
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<td>O. C. Adhesives Corporation</td>
<td>76 Fourth Street, Brooklyn, New York 11231</td>
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<td>OKC Division</td>
<td>The Fanner Manufacturing Co. Textron, Incorporated 900 N. Chapel Street, Louisville, Ohio</td>
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<td>Oakley Die &amp; Mfg. Company</td>
<td>4426 Brazee Street, Cincinnati, Ohio 45209</td>
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<td>Ohio Sealer &amp; Chemical Corp.</td>
<td>3060 E. River Road, Dayton, Ohio 45439</td>
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<td>Ohnuma Seisakusho Mfg. Co., Ltd.</td>
<td>24-1, 5 Chome, Ohmori-nishi, Ohta-ku, Tokyo, Japan</td>
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<td>Omni Division</td>
<td>C. Tennant, Sons &amp; Co. of New York 100 Park Avenue, New York, New York 10017</td>
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<td>Orbit of California</td>
<td>211 Los Molinos, San Clemente, California 92672</td>
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<td>Osley &amp; Whitney, Inc.</td>
<td>130 Southampton Road, Wesfield, Mass. 01085</td>
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<td>PPG Industries</td>
<td>Coatings &amp; Resins Division 1 Gateway Center, Pittsburgh, Pennsylvania 15222</td>
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<td>Pacific Resins &amp; Chemicals, Inc.</td>
<td>3400 - 13th Avenue SW, Seattle, Washington 98134</td>
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<td>Fantasote Company</td>
<td>277 Park Avenue, New York, New York 10017</td>
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<td>Parcloyd Chemical Company</td>
<td>140 Greenwood Avenue, Midland Park, New Jersey 07432</td>
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<td>Parr Molding Compounds Corp.</td>
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<td>Parsons, M. W., Plymouth Div.</td>
<td>S. B. Penick &amp; Company, 100 Church Street, New York, New York 10008</td>
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<td>Pasadena Hydraulics, Inc.</td>
<td>1433 Lidcombe Avenue, El Monte, California 91733</td>
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<td>Patent Button Company of Tenn.</td>
<td>2221 Century Street, Knoxville, Tennessee 37901</td>
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<td>Perfect Mold Company, Inc.</td>
<td>1500 N. Crooks Road, Clawson, Michigan 48017</td>
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<td>Perkin-Elmer Corporation</td>
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<td>Pfizer, Chas., &amp; Co., Inc.</td>
<td>Industrial Chemicals Div.</td>
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<td>Pfizer, Chas., &amp; Co., Inc.</td>
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<td>Plastic Electro-Finishing Corp.</td>
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<td>2628 St. Louis Street, Fort Worth, Texas 76101</td>
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<td>Plastic Mold Tool &amp; Die Co., Inc.</td>
<td>1 Maple Street, E. Rutherford, New Jersey 07073</td>
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Plastic Molding Powders, Inc.
487 Forest Street
Kearny, New Jersey

Polychrome Dispersions, Inc.
13429 S. Western Avenue
Gardena, California

Plasti-Cast Mold & Products Co.
1430 Archwood Avenue
Akron, Ohio 44306

Polymer Machinery Corporation
60 Woodlawn Road
Berlin, Connecticut

Plastics Development Corp.
145 Roswell Street
Smyrna, Georgia 30080

Polyrez Company, Inc.
S. Columbia Street
Woodbury, New Jersey 08096

Plastics Engineering Company
1607 Geele Avenue
Sheboygan, Wisconsin 53081

Polytech Company
10423 Trenton Avenue
St. Louis, Missouri 63132

Plastima GmbH
Postfach 586
4000 Dusseldorf-Oberkassel,
Germany

Polyvinyl Chemicals, Inc.
26 Howley Street
Peabody, Mass. 01960

Plastimac s. r. l.
Piazzale Giulio Cesare 9
Milano, Italy

Precision Products Co., Inc.
262 E. 16th Street
Paterson, New Jersey 07524

Plastimac s. r. l.
Piazzale Giulio Cesare 9
Milano, Italy

Premier Thermo Plastics Co.
3001 Middletown Road
Jeffersontown, Kentucky 40029

Plas-Tech Engineering
1928 S. 62nd Street
Milwaukee, Wisconsin 53219

Prime molds, Inc.
1817 Front Street
Cuyahoga Falls, Ohio 44221

Plastima GmbH
Postfach 586
4000 Dusseldorf-Oberkassel,
Germany

Primas Moldmakers, Inc.
T. C. Industrial Park
Depew, New York 14043

Plasto-Cast Mold & Products Co.
1430 Archwood Avenue
Akron, Ohio 44306

Princeton Chemical Research, Inc.
P. O. Box 652
Princeton, New Jersey 08540

Plastics Engineering Company
1607 Geele Avenue
Sheboygan, Wisconsin 53081

Procter & Gamble
Industrial Soap & Chemical Products Div.
P. O. Box 599
Cincinnati, Ohio 45201

Plastics Engineering Company
1607 Geele Avenue
Sheboygan, Wisconsin 53081

Progressive Tool & Die Company
Turnpike Road
Westboro, Massachusetts 01581

Plas-Tech Engineering
1928 S. 62nd Street
Milwaukee, Wisconsin 53219

Prospect Mold & Die Company
1817 Front Street
Cuyahoga Falls, Ohio 44221

Plastima GmbH
Postfach 586
4000 Dusseldorf-Oberkassel,
Germany

RC Division
Hooker Chemical Corporation
New South Road
Hicksville, New York 11802

Plastima GmbH
Postfach 586
4000 Dusseldorf-Oberkassel,
Germany

Primas Moldmakers, Inc.
T. C. Industrial Park
Depew, New York 14043

Plastics Engineering Company
1607 Geele Avenue
Sheboygan, Wisconsin 53081

Procter & Gamble
Industrial Soap & Chemical Products Div.
P. O. Box 599
Cincinnati, Ohio 45201

Plastics Engineering Company
1607 Geele Avenue
Sheboygan, Wisconsin 53081

Progressive Tool & Die Company
Turnpike Road
Westboro, Massachusetts 01581

Plastima GmbH
Postfach 586
4000 Dusseldorf-Oberkassel,
Germany

Prospect Mold & Die Company
1817 Front Street
Cuyahoga Falls, Ohio 44221

Plastima GmbH
Postfach 586
4000 Dusseldorf-Oberkassel,
Germany

RC Division
Hooker Chemical Corporation
New South Road
Hicksville, New York 11802
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<td>Raybestos Manhattan, Inc.</td>
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<td>Rector Engineering &amp; Plastics Co.</td>
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<td>Ren Plastics, Incorporated</td>
<td>5656 S. Cedar Street</td>
<td>Lansing, Michigan 48909</td>
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<td>Research Sales, Incorporated</td>
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<td>Resinous Chemicals Corp.</td>
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<td>1651 - 18th Street</td>
<td>Santa Monica, California 90404</td>
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<td>White Plains, New York 10602</td>
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<td>Rheinstahl Henschel AG</td>
<td>Postfach 786</td>
<td>35 Kassel-2, Germany</td>
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<td>Richardson Company</td>
<td>Insurok Division</td>
<td>2747 Lake Street</td>
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<td>Polymers Division</td>
<td>345 Morgan Lane</td>
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<td>Rochelle Plastic Mold Co., Inc.</td>
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<td>Clifton, New Jersey 07013</td>
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<td>Rodgers Hydraulic, Inc.</td>
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<td>Roehlens Engraving Works</td>
<td>701 Jefferson Road</td>
<td>Rochester, New York 14623</td>
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<td>Rogers, Connecticut 06263</td>
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<td>Rudolph-Martin</td>
<td>Maschinen-und Formenbau</td>
<td>Industriestrasse 47</td>
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<td>New Brunswick, New Jersey</td>
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<td>Charlotte, N. C. 28203</td>
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<td>St. Lawrence Hydraulic Co., Inc.</td>
<td>2424 Beech Daly Road</td>
<td>Inkster, Michigan 48141</td>
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<td>SamSon Molds, Inc.</td>
<td>1028 E. Edna Street</td>
<td>Covina, California 91722</td>
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<td>Sarcol, Incorporated</td>
<td>3050 W. Taylor Street</td>
<td>Chicago, Illinois 60612</td>
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<td>Sartomer Resins, Incorporated</td>
<td>P. O. Box 56</td>
<td>Essington, Pa. 19029</td>
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<td>Saunders Engineering Corp.</td>
<td>4515 Alger Street</td>
<td>Los Angeles, California 90039</td>
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<td>Schenectady Chemicals, Inc.</td>
<td>Congress &amp; Tenth Street</td>
<td>Schenectady, New York 12301</td>
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7-K Color Corporation
927 N. Citrus Avenue
Hollywood, California 90038

Smooth-On Manufacturing Co.
572 Communipaw Avenue
Jersey City, New Jersey 07304

Shamrock-Neatway Products, Inc.
1010 Lyndale Avenue N.
Minneapolis, Minnesota

Solar Chemical Corporation
34 Monument Square
Leominster, Massachusetts 01483

Shaw, Francis, Ltd. (Canada)
1393 Grahams Lane
Burlington, Ontario, Canada

South Bend Lathe
400 W. Sample Street
South Bend, Indiana 46623

Shaw Industries, Inc.
RD 2, P. O. Box 591
Franklin, Pennsylvania 16323

Spectrolab Division
12484 Gladstone Avenue
Sylmar, California 91342

Shell Chemical Company
50 W. 50th Street
New York, New York 10020

Spencer Kellogg Division
Textron, Incorporated
120 Delaware Avenue
Buffalo, New York 14240

Shell Chemical Company
Industrial Chemical Division
110 W. 51st Street
New York, New York 10020

Springfield Cast Products, Inc.
124 Switzer Avenue
Springfield, Mass. 01109

Shelmark Industries, Inc.
320 Fletcher Street
Columbus, Ohio 43215

Stanchel Engineering Co.
5416 Cleo Street
North Hollywood, California

Sherwin-Williams Company
Pigment, Color & Chemical Dept.
101 Prospect Avenue
Cleveland, Ohio 44101

Standard Polymers, Inc.
1 Riverdale Avenue
Bronx, New York 10463

Shin-Etsu Chemical Company
2, Marunouchi 1-chome
Chiyoda-ku, Tokyo, Japan

Standard Tool Company
217 Hamilton Street
Leominster, Mass. 01453

Shuron/Continental Company
40 Humboldt
Rochester, New York 14609

Stauffer Chemical Company
Plastics Division
299 Park Avenue
New York, New York

Silmar Chemical Corporation
Subsidiary of Standard Oil Co. of Ohio
12333 S. Van Ness Avenue
Hawthorne, California 90250

Steeltco Manufacturing Co.
3418 Gratiot Street
St. Louis, Missouri 63103

Sinclair Petrochemicals, Inc.
600 Fifth Avenue
New York, New York 10020

Steere Enterprises, Inc.
285 Commerce Street
Tallmadge, Ohio 44278
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<td>Thiodol Chemical Corporation</td>
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<td>Trenton, New Jersey 08607</td>
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<td>316 E. Seventh Street N.</td>
<td>Newton, Iowa 50208</td>
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<td>Thompson Apex Company</td>
<td>505 Central Avenue</td>
<td>Pawtucket, R. I. 02862</td>
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<td>Thotc, J. G., Inc.</td>
<td>60 Milltown Road</td>
<td>Union, New Jersey 07083</td>
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<td>Tritmus Optical Company</td>
<td>1015 Commerce</td>
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<td>Trk-Con, Incorporated</td>
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<td>Medford, Mass. 02155</td>
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<td>Trim Molded Products Corp.</td>
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<td>Trulzi, S. p. a.</td>
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<td>Tylac Chemicals Division</td>
<td>International Latex &amp; Chemical Corp.</td>
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Ube Industries, Ltd. | 1976 Ogoshi Ube-Shi | Yamaguchi-Ken, Japan
Union Carbide Corporation | Chemicals Division | 270 Park Avenue | New York, New York 10017
Union Carbide Corporation | Plastics Division | 270 Park Avenue | New York, New York 10017
Uniroyal, Incorporated | 1230 Avenue of the Americas | New York, New York 10020
U. S. Industrial Chemical Co. | Division of National Distillers & Chemical Corporation | 99 Park Avenue | New York, New York 10016
United States Gypsum Company | 101 S. Wacker Drive | Chicago, Illinois 60606
United States Rubber Company | 1230 Avenue of the Americas | New York, New York 10020
Universal Optical Company | 23 Acorn | Providence, Rhode Island 02903
Universal Plastics Corporation | 352 Harrison Street | Passaic, New Jersey 07056
Vacform Company | 8 Lois Street | Norwalk, Connecticut 06851
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Address Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whitford Chemical Corporation</td>
<td>20 N. Matlack Street, W. Chester, Pennsylvania 19380</td>
</tr>
<tr>
<td>Wilco Company</td>
<td>4425 Bandini Boulevard, Los Angeles, California 90023</td>
</tr>
<tr>
<td>Williamson Adhesives, Inc.</td>
<td>8220 Kimball Avenue, Skokie, Illinois 60076</td>
</tr>
<tr>
<td>Williams-White &amp; Co.</td>
<td>600 Third Avenue, Moline, Illinois 61265</td>
</tr>
<tr>
<td>Windsor, R.H., Ltd.</td>
<td>Leatherhead Road, Chessington, Surrey, England</td>
</tr>
<tr>
<td>Witco Chemical Company, Inc.</td>
<td>277 Park Avenue, New York, New York 10017</td>
</tr>
<tr>
<td>Woodmont Products, Inc.</td>
<td>County Line &amp; New Road, Huntingdon Valley, Pennsylvania</td>
</tr>
<tr>
<td>Younger-Med Optics</td>
<td>3788 Broadway Place, Los Angeles, California 90007</td>
</tr>
<tr>
<td>Youngstown Vinyl Compounds, Inc.</td>
<td>4521 Lake Park Road, Youngstown, Ohio</td>
</tr>
<tr>
<td>Zack Radiant Plt Company</td>
<td>122 Fayette Avenue, Wayne, New Jersey 07470</td>
</tr>
<tr>
<td>Vdlc Division</td>
<td></td>
</tr>
<tr>
<td>Valentine Sugars, Inc.</td>
<td>726 Whitney Bldg, New Orleans, Louisiana</td>
</tr>
<tr>
<td>Van Dorn Plastic Machinery Co.</td>
<td>2085 E. 79th, Cleveland, Ohio 44104</td>
</tr>
<tr>
<td>Vanderbilt, R. T., Co., Inc.</td>
<td>230 Park Avenue, New York, New York 10017</td>
</tr>
<tr>
<td>Vernon-Benshoff Co., Inc.</td>
<td>1413 N. Pearl Street, Albany, New York 12201</td>
</tr>
<tr>
<td>Verson Allsteel Press Co.</td>
<td>1355 E. 93rd Street, Chicago, Illinois 60619</td>
</tr>
<tr>
<td>Vogt Manufacturing Corporation</td>
<td>100 Fernwood Avenue, Rochester, New York 14621</td>
</tr>
<tr>
<td>Wabash Metal Products Co., Inc.</td>
<td>1569 Morris Street, Wabash, Indiana 46992</td>
</tr>
<tr>
<td>Ware Chemical Corporation</td>
<td>P. O. Box 783, Westport, Connecticut 06881</td>
</tr>
<tr>
<td>Western Coating Company</td>
<td>Stephenson Highway at 14-1/2 Mile Road, Royal Oak, Michigan 48073</td>
</tr>
<tr>
<td>Westwood Chemical Co., Inc.</td>
<td>801 Second Avenue, New York, New York 10017</td>
</tr>
</tbody>
</table>
APPENDIX III

SAMPLES OF LETTERS SENT TO SUPPLIERS
AND MANUFACTURERS
Gentlemen:

Life Systems Research Institute is conducting a feasibility study for the U. S. Army Medical Research and Development Command under Contract DADA 17-69-C-9062 for the development of a new optical laboratory for military field use.

As part of this study a survey of plastic material capable of being used for ophthalmic lenses is being made. From this survey materials of suitable quality will be further evaluated.

Initially the prime requisite is for materials that are transparent with further evaluation being made on the basis of the other characteristics of the materials. Of special interest would be new materials, or materials under development.

It would be of great help to this research effort if you could provide information concerning any of your plastic materials that you consider might fulfill the requirement. Please include the properties of the substance if available.

Life Systems Research Institute is a non-profit corporation primarily engaged in health/medical research and has no proprietary interests.

Any assistance you may be able to offer will be greatly appreciated.

Sincerely,

J. T. Celentano, M.D.
Project Manager
Army Field Lens Project

A non-profit organization devoted to research in health, education and welfare systems.
Gentlemen:

Life Systems Research Institute is conducting a feasibility study for the U. S. Army Medical Research and Development Command under Contract DADA 17-69-C-9062 for the development of a new optical laboratory for military field use.

As part of this study a survey of plastic materials, techniques, and devices suitable for optical/ophthalmic lens and frame processing is being made. From this survey materials, techniques, and devices suitable for field use will be identified. Of special interest would be: automated techniques, devices capable of being carried by a 1-1/2 ton truck, and new developments.

It would be of great help to this research effort if you could provide information concerning any materials, techniques, processes, or devices that you consider might fulfill this requirement.

Life Systems Research Institute is a non-profit corporation primarily engaged in health/medical research and has no proprietary interests.

Any assistance you may be able to offer will be greatly appreciated.

Sincerely,

J. T. Celentano, M.D.
Project Manager
Army Field Lens Project

A non-profit organization devoted to research in health, education and welfare systems.
Gentlemen:

Life Systems Research Institute is conducting a feasibility study for the U. S. Army Medical Research and Development Command under Contract DADA 17-69-C-9062 for the development of a new optical laboratory for military field use.

As part of this study a survey of plastic lens and frame materials and processes is being made. From this survey items suitable for a new field optical laboratory will be identified. Of special interest would be: new developments, automated techniques, and devices for producing plastic lenses or frames that could be transported by a 1-1/2 ton truck.

It would be of great help to this research effort if you could provide information concerning materials, techniques, or devices that you consider might fulfill this requirement.

In addition, a visit to your plastic lens processing facilities would be extremely helpful if this can be arranged.

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Any assistance you may be able to offer will be greatly appreciated.

Sincerely,

J. T. Celentano, M. D.
Project Manager
Army Field Lens Project

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It would be of great help to this research effort if you could provide information concerning materials, techniques, or devices that you consider might fulfill this requirement.

In addition, a visit to your plastic frame processing facilities would be extremely helpful if this can be arranged.

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Any assistance you may be able to offer will be greatly appreciated.

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J. T. Celentano, M.D.
Project Manager,
Army Field Lens Project

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It would be of great help to this research effort if you could provide information concerning materials, techniques, or devices that you consider might fulfill this requirement.

As this program is being conducted in association with Univis, Inc., you may have received a similar query from them. However, as you are a prominent supplier in this field it is important that your contributions to the plastics industry not be overlooked.

Life Systems Research Institute is a non-profit corporation primarily engaged in health/medical research and has no proprietary interests.

Any assistance you may be able to offer will be greatly appreciated.

Sincerely yours,

J. T. Celentano, M.D.
Project Manager
Army Field Lens Project

ITU:pf

A non-profit organization devoted to research in health, education and welfare systems.
June 23, 1969

Attention: Director of Research & Development

Gentlemen:

We have recently received a contract in response to RFP DADA 17-69-R-9002 from the J. S. Army Medical Research & Development Command to conduct a "Feasibility Study of Automatic Fabrication of Spectacle Lenses".

As a phase of this study, we intend investigating all currently available, suitable plastic materials as well as those in the development stage. This would include both transparent plastics and abrasion resistant coatings.

Since you are an outstanding leader in the field of plastic developments I'm confident there are some current projects in your laboratories which would prove of value for this study.

I'd be privileged if an appointment could be arranged at which these developments could be discussed.

Sincerely,

K. Greshes
Vice President
Research & Development

XG:ts
June 20, 1969

Gentlemen:

We have recently received a contract from the U. S. Army Medical Research & Development Command to evaluate the possible use of plastic for spectacles and lenses.

In this connection, we are interested in evaluating all transparent plastics, rigid or flexible, for possible lens application. We are also interested in evaluating any material (transparent or opaque) that would have properties especially exotic for spectacle frame application.

This is an extensive study which we can properly execute only with the cooperation of industry and the universities. We, therefore, solicit your assistance and request samples of any materials of your manufacture which you consider applicable.

For our evaluation, we would require approximately one to two square feet of material, if available in sheet form (thickness of .060" is desired though any other available thickness is usable). If samples exist in the form of standard plastic chips, then 24 such chips would equally serve our purpose.

Thank you for your kind consideration.

Very truly,

M. Greshes
Vice President
Research & Development
June 20, 1969

Gentlemen:

We have recently received a contract from the U. S. Army Medical Research & Development Command to evaluate the possible use of plastic for spectacles and lenses.

In this connection, we are interested in evaluating all transparent plastics, rigid or flexible, for possible lens application. We are also interested in evaluating any material (transparent or opaque) that would have properties especially exotic for spectacle frame application.

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Very truly,

M. Greshes
Vice President
Research & Development

M.G.:ts