Technology Transfer Initiatives

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ABSTRACT

This report summarizes the University of Alabama in Huntsville (UAH) technology transfer activities with the Marshall Space Flight Center (MSFC) for the period of April 1993 through December 1993.
1.0 INTRODUCTION

On June 10, 1992, the University of Alabama in Huntsville (UAH) joined the technology transfer effort at the NASA Marshall Space Flight Center Technology Utilization Office (MSFC/TUO). Since that time, the UAH contribution has included the creation of the concept of critical area response packages for those frequent technical requests, assisting in the formation of the Huntsville and Birmingham Chambers of Commerce technology transfer programs, and obtaining publicity for the MSFC technology transfer program.

2.0 CRITICAL AREA RESPONSE PACKAGES (CARs)

Early in 1993, the MSFC/TUO and UAH conceived of the concept of developing stand-alone, integrated data packages on MSFC technology that would serve industrial needs previously determined to be critical. Furthermore, after reviewing over 500 problem statements received by MSFC, it became obvious that many of these requests could be satisfied by a standard type of response. As a result, UAH has developed two critical area response packages: 1) CFC replacements and 2) modular manufacturing and simulation.

2.1 CFC Replacement Critical Area Response (CAR)

2.1.1 Description

The CFC replacement critical area response package is a comprehensive 633 page document that describes the problems and current solutions to the process of replacing CFCs (chlorofluorocarbons) as solvents, refrigerants and blowing agents. The CAR discusses the schedule for replacement of these compounds, including other ozone depleters such as halon, carbon tetrachloride and methyl chloroform. Included in the CAR are the properties of several replacements for the soon-to-be-banned chemicals. The replacements include aqueous and semi-acqueous products as well as particle blast cleaners such as ice particles and carbon dioxide pellets. Also discussed in the CAR are vapor degreasing and hand wipe solvent alternatives. In addition to product literature, considerable data are provided in terms of references to other organizations that are active in the solvent replacement process.

2.1.2 Technical Requests

Figure 1 gives the distribution of the CFC replacement CAR requests by month through January 4, 1994. Appendix A lists the firms requesting the CAR. The large increase in requests for the CARs beginning in January, 1994, is the result of a brief article in the January issue of Modern Machine Shop (See Section 3.1).
Figure 1. Requests for CFC Replacement Critical Area Response Package

2.2 Modular Manufacturing and Simulation Critical Area Response (CAR)

2.2.1 Description

The apparel industry in the United States is undergoing significant changes. One area experiencing change is the method of apparel manufacturing. This change in manufacturing is in response to market pressures for rapid style changes and quick response to customer orders. For years the standard method of manufacturing has been the progressive bundle system (PBS). In the PBS, operators sit at the machines with each operator performing only one operation. As a result, large work-in-process (WIP) generally builds up between stations. Garments are generally inspected at the end of the line. Work is done in bundles of several dozen. Operators are paid based on production or piece rate.

Many apparel firms are beginning to experiment with the concepts of modular manufacturing to improve the process, minimize system variability, improve quality, and reduce cost. Modular manufacturing has been defined as a contained, manageable work unit of five to seventeen operators performing a measurable task. The operators are interchangeable among tasks within the
group to the extent practical, and incentive compensation is based on the team’s output of first quality product.

Some of the characteristics of a manufacturing module are:

- Operators are cross-trained
- Group usually produces complete garment
- Each operator performs one or more sewing tasks
- Group chooses leader who interfaces with management
- Group given considerable latitude in performing specific tasks and in machine and work assignments
- Inspection is done within group which corrects errors
- Group has weekly meetings on company time and has access to management when required
- Group is paid fixed salary, sometimes augmented by production bonuses
- Group members are credited only with defect-free production

By grouping machines in a manufacturing module such that a garment can be passed from one machine directly to the next machine, material handling and WIP are greatly reduced. Also, defects are usually detected much earlier in the production cycle and thus promptly corrected. The advantages of modular manufacturing are:

- Reduced WIP and throughput time
- Reduced inspection and timekeeping
- Reduced supervision and bundle handling
- Reduced employee turnover and absenteeism
- Improved quality
- Increased worker and plant productivity

There are also disadvantages of modular manufacturing including:

- Increased number of machines
- Possible increase in floor space
- Plantwide training may be required before implementation
- Considerable supervisory planning is needed when changing modules for new products

UAH, with funding from the Alabama Department of Economic and Community Affairs (ADECA) and the Alabama Industrial Development Training (AIDTraining), has developed three simulators to assist apparel manufacturers design and analyze manufacturing modules. These simulators were based on technology described in MSFC Tech Briefs MFS26091 and MFS28398.

The three simulators are:
• SSE3 is an excellent training tool for the first-time user of computer simulation and probably cannot be used to model a real world apparel manufacturing module.

• SSE6 can be used to model apparel manufacturing modules that are based on the TSS (Toyota Sewing System) where all operators stand and move between stations. Work is done in lots of one garment. Figure 2 gives the operator movement rules within the module.

• SSE5 can be used to model manufacturing modules where some operators are fixed at machines while other operators move between several machines. The moveable operators move based on a defined set of rules such as a time limit, bundle limit, lower WIP, and upper WIP. Figure 3 gives the operator movement rules within the module.

These simulators have been documented in UAH Research Reports 92-03 and 92-04. These reports have been combined with several additional articles on modular manufacturing into a MSFC document: Modular Manufacturing and Simulation Critical Area Response, March 1993.

The SSE6 has the following operator movement rules:

• Parts move forward in the manufacturing module. Operations move forwards with the part and also move backwards for additional work.

• An operator performs an operation at a station and will move forwards with the part to the next station and performs the operation until the operator reaches an operator at a station. The part is then placed in front of the station, or passed directly to the operator, if the operator is free.

• If an operator is not busy, the operator will move backwards until there is an available part. If there is no waiting part, the operator will interrupt the first operator reached. The interrupted operator will then move backwards to either find an available part or another busy operator to interrupt. The interrupting operator will then complete the interrupted operation.

If a station has more than one machine, the operator movement rule for that station is as follows:

• If the operator number, who has just completed working on a part, is greater than the other operator numbers at that station, the operator will attempt to move forward to the next station with the part. If the next station is busy, the operator will interrupt one of the other operators at the current station.

• If the operator number, who has just completed working on a part, is less than the other operator numbers at that station, the operator will move backwards for more work. If the backwards station is busy, the operator will interrupt the operator.

Figure 3. SSE6 Operator Movement Rules
The input parameters for a fixed operator are:

- Priority = 1
- Operator efficiency (%) = value 1 to 150
- Other parameters = unused

The input parameters for a moveable operator are:

- Priority = 1, 2, 3, ... (1 = home station)
- Operator efficiency (%) = value 1 to 150
- Lower WIP limit at this station = 0, 1, 2, 3, ... lots
- Upper WIP limit at this station = 0, 1, 2, 3, ... lots
- Bundle limit at this station = 0, 1, 2, 3, ... lots
- Time limit operator spends at this station = any positive number

The rules for the movement of a moveable operator are:

**Rule 1:** Operator will attempt to move to another station in the priority list when the operator has worked more than the "Time Limit" at the current station, or when the operator has completed, or exceeded, the "Bundle Limit" at the current station and the operator has completed a lot of garments.

**Rule 2:** If Rule 1 is satisfied, the operator will move from the current station to the first station in the priority list when one of the following conditions is satisfied:

- **Rule 2a:** WIP at current station is LESS than the upper WIP limit and the WIP at a station in the priority list is GREATER than the upper WIP limit.

- **Rule 2b:** WIP at current station is LESS than the lower WIP limit and the WIP at a station in the priority list is GREATER than the lower WIP limit

If Rule 1 is satisfied and both Rules 2a and 2b are not satisfied, then the operator will stay at the current station and do another lot. After each lot the operator will try to move depending on Rules 2a or 2b.

When the operator can no longer do work at the current station because there is no WIP and Rules 2a and 2b are not satisfied, the operator will attempt to go to the first station in the priority list that has WIP greater than zero, rather than remain idle at the current station. However, if the operator still cannot move, the operator will remain at the current station and be idle. Note that the operator will attempt to move every time the system changes state.

The above rules always check the parameters in the assigned priority sequence. For example, if the operator is at Station 4 and the priority sequence is Station 2, Station 3, Station 4, and Station 5, the rules are always tried starting with Station 2, then Station 3 and then Station 5.

It should be noted that some of the parameters may be set to zero. For example, if the "Time Limit" and "Bundle Limit" are zero, then Rule 1 is always true and Rules 2a and 2b are tested after the operator has completed every lot.

Figure 2. SSE5 Operator Movement Rules
2.2.2 Technical Requests

Figure 4 gives the distribution of requests by month for the modular manufacturing CAR. The large increase in the number of requests starting in June, 1993, has resulted from several articles in Bobbin magazine and Apparel Industry Magazine (See Section 3.1). Figure 5 gives the distribution of the requests by state. Appendix B gives the firms requesting the CAR.

2.2.3 Evaluation

A followup survey was conducted in October, 1993, of all the apparel firms that had requested copies of the modular manufacturing software. The objective of the survey was to determine how the software had been used by the firms and to measure the economic impact of the use of the software. A copy of the questionnaire is given in Appendix C. A total of 227 firms were sent copies of the questionnaires.

In summary:

- 227 questionnaires mailed
- 39 responses (17.2% response rate)
- Of the 39 responses
  - 27 firms had used the software (69.2%)
  - 11 firms had not used the software (28.2%)
  - 1 firm had not received the software (2.6%)

Question 2 of the survey stated “How has the software been used?” The responses were:

- To simulate sewing module before installed on floor
- To determine staffing and job assignment, as well as projected production
- Instruction purposes/setup analysis
- To simulate possible improvements in our manufacturing team and provide theoretical basis for improvements
- To run different configurations for setting up modular line for making shirts
- Verify and test possibility of new lines/clusters
- In process of converting progressive bundle system to modular and used software to assist in transition
- To keep up with latest technology so we can inform our contractors of new technologies
- Setup and balance lines
- To determine best parameters for module size, cross training and theoretical output
- Overview of modular process
- Test evaluation
- See how modular manufacturing works in our situation
Figure 4. Request for Modular Manufacturing Simulators

Total = 363

Month

A S O N D J F M A M J A S O N D

Number of problem statements

- 6 2 0 3 1 9 5 6 4 2 128 46 43 58 24 10
We are currently modular in production. As we cost new products, we run various simulations to get feel for actual versus estimated.

To get better understanding of modular concepts.

To evaluate balancing, number of machines required, and optimum number of people in modular line.

As an evaluation program and entry point into simulation.

To confirm line capacity of newly established module unit.

Question 3 of the survey stated "What effect will the software have on your firm?" Check all the boxes that apply.

- Convert (or planning to convert) to modular manufacturing
- Reduce operating costs Estimate $__________
- Increase market share
- Increase sales Estimate $__________
- Improve competitive position
- Opportunity to expand operations
- Increase profit margin
- Introduction of new products
- Opportunity to hire new employees Estimate new employees__________
- Other ____________

The survey results to Question 3 are:

<table>
<thead>
<tr>
<th>Response</th>
<th>Responses</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convert (or planning to convert to modular)</td>
<td>12</td>
<td>44%</td>
</tr>
<tr>
<td>Reduce operating costs</td>
<td>9</td>
<td>33%</td>
</tr>
<tr>
<td>Increase market share</td>
<td>2</td>
<td>7%</td>
</tr>
<tr>
<td>Increase sales</td>
<td>2</td>
<td>7%</td>
</tr>
<tr>
<td>Improve competitive position</td>
<td>8</td>
<td>30%</td>
</tr>
<tr>
<td>Opportunity to expand operations</td>
<td>3</td>
<td>11%</td>
</tr>
<tr>
<td>Increase profit margin</td>
<td>5</td>
<td>19%</td>
</tr>
<tr>
<td>Introduction of new products</td>
<td>4</td>
<td>15%</td>
</tr>
<tr>
<td>Opportunity to hire new employees</td>
<td>1</td>
<td>4%</td>
</tr>
</tbody>
</table>

Sample 27 firms

Question 3 of the survey also asked the firm to estimate the reduction in operating costs. Five firms responded with the following cost savings:

- Firm A $300,000
- Firm B $100,000
- Firm C $5,000
- Firm D $5,000
- Firm E $2,500,000
3.0 PUBLICITY

3.1 News Releases

Letters were sent to the following organizations requesting publicity on the MSFC technology transfer program:

- American Apparel Contractors Association (AACA) *
- Alabama Textile Manufacturing Association (ATMA)
- Apparel Industry Magazine *
- Bobbin magazine *
- Southeastern Apparel Manufacturers & Suppliers Association
- Greater blouse, skirt & Undergarment Association
- Machine Design
- Modern Machine Shop*

Those organizations marked with an * did publish an article on the MSFC TT program. Bobbin magazine did a cover story on the MSFC program. Apparel Industry Magazine did a one page article on the modular manufacturing and simulation CAR. Modern Machine Shop did a one page article on the CFC replacements. Copies of the articles that had been received are given in Appendix D. Also, copies of the news releases sent to Machine Design and Modern Machine Shop are given in Appendix D.

3.2 Seminars

The following seminars were held for those firms that had requested copies of the modular manufacturing and simulation CAR:

- Modular Manufacturing and Simulation Location: Alabama Center for Advanced Technology Transfer (ACATT)
  Date: August 31 - September 1, 1993
  Sponsors: UAH, ACATT, MSFC, and Southeast RTTC
  Attendees:
  - King Louie International (2 attendees)
    Adair, OK
  - Playtex Apparel, Inc
    Dorado, PR
  - Abanda
    Decatur, AL
  - National Garment Co (2 attendees)
    Chanute, KS
  - National Garment Co
    St. Louis, MO
  - Fashionnaire Apparel, Inc
    Marseilles, IL
  - Pleasant Hill Mfg
Wagoner, OK

- Modular Manufacturing and Simulation
  Location: Alabama Center for Advanced Technology Transfer (ACATT)
  Date: October 26 - 27, 1993
  Sponsor: UAH, ACATT, MSFC, and Southeast RTTC
  Attendees:
    - Bearse Manufacturing Co
      New Windsor, NY
    - Marithe & Francois Girbaud (2 attendees)
      Greensboro, NC
    - Vanity Fair Mills, Inc
      Jackson, AL
    - Liberty Trousers Co
      Birmingham, AL
    - Southern Tech
      Marietta, GA

A copy of the seminar announcement is given in Appendix E.

A seminar was also planned on October 27, 1993, for those firms that had requested copies of the CFC replacement CAR. The location of the seminar was ACATT. Sponsors were UAH, MSFC, Huntsville Chamber of Commerce, Southeast RTTC. The seminar was cancelled because of low enrollment. A copy of the seminar announcement is given in Appendix E.

UAH was also invited to conduct a seminar on modular manufacturing and simulation at the 1993 Bobbin Show in Atlanta on October 5, 1993. The seminar was conducted by Dr. B. Schroer. The announcement of the seminar along with the 24 attendees are given in Appendix E.

3.3 Articles and Conference Papers

The following journal articles have been published or submitted for publication:

- NASA's Role in Apparel Manufacturing Simulation, APICS Textile and Apparel Specific Industry Group, Textile and Apparel SIG Newsletter, Third Quarter, 1993, M. Ziemke and I. Akbay (See Appendix D)

The following abstracts have been submitted for presentation at the 1994 Technology Transfer Conference:

- Technology Transfer: A Chamber of Commerce Model, R. Sampson, B. Schroer and K. Harwell
- A Product Development Approach to Marketing Technology, W. McCain and M. Ziemke
- A State's Approach to Transferring Technology to a Target Industry, B. Schroer and M. Ziemke

4.0 CHAMBER OF COMMERCE TECHNOLOGY TRANSFER NETWORK

4.1 Huntsville Chamber of Commerce

4.1.1 Formation

In 1992 the Huntsville/Madison County Chamber of Commerce's Engineering, Science and Technology Committee established the Technology Transfer Subcommittee with the charge to identify approaches for the Chamber to assist its members, as well as non-members, access to the technologies at the federal laboratories in North Alabama. These federal laboratories included the U.S. Army Missile Command (MICOM), U.S. Army Space and Strategic Defense Command (SSDC), NASA's Marshall Space Flight Center (MSFC) and the Tennessee Valley Authority's National Fertilizer and Environmental Research Center (NFERC). The Chamber's operations manual is given in Appendix F.

4.1.2 Technical Requests

Since the Chamber began its technology transfer program in early 1993, 31 firms have attended a Chamber technology transfer program, 27 firms have requested visits, and 59 technical requests have been received from 26 firms.

Figure 6 give the distribution of the firms submitting requests by number of employees. Note that 68% of the firms have less than 100 employees. Also, 30% of the firms have over 250 employees with four of these firms having over 500 employees.

Table I list the firms submitting technical requests by SIC code. The largest SIC category submitting requests was SIC8711 and 8731. This was anticipated because of the large number of aerospace and defense contractors in Huntsville. Also, four firms had SIC code 3600, Electronics and Electrical Equipment. This was also anticipated because of the large number of electronics manufacturing/assembly firms in Huntsville.
<table>
<thead>
<tr>
<th>Employees</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 50</td>
<td>11 42.3%</td>
</tr>
<tr>
<td>50 - 100</td>
<td>4 15.4%</td>
</tr>
<tr>
<td>100 - 250</td>
<td>3 11.5%</td>
</tr>
<tr>
<td>250-500</td>
<td>4 15.4%</td>
</tr>
<tr>
<td>Over 500</td>
<td>4 15.4%</td>
</tr>
</tbody>
</table>

Figure 6. Requests by Firm Employment

Table I. Firms submitting requests by SIC code

<table>
<thead>
<tr>
<th>SIC</th>
<th>Description</th>
<th>Number of firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>2200</td>
<td>Textile mill products</td>
<td>1</td>
</tr>
<tr>
<td>2800</td>
<td>Chemical and allied products</td>
<td>1</td>
</tr>
<tr>
<td>3400</td>
<td>Fabricated metal products</td>
<td>2</td>
</tr>
<tr>
<td>3500</td>
<td>Industrial machinery and computer</td>
<td>2</td>
</tr>
<tr>
<td>3600</td>
<td>Electronic and electrical equipment</td>
<td>4</td>
</tr>
<tr>
<td>3700</td>
<td>Transportation equipment</td>
<td>4</td>
</tr>
<tr>
<td>3800</td>
<td>Measuring and controlling instruments</td>
<td>3</td>
</tr>
<tr>
<td>4911</td>
<td>Electric services</td>
<td>1</td>
</tr>
<tr>
<td>8062</td>
<td>General medical and surgical hospitals</td>
<td>1</td>
</tr>
<tr>
<td>8711</td>
<td>Engineering services</td>
<td>3</td>
</tr>
<tr>
<td>8731</td>
<td>Commercial physical research</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>sample 26</td>
<td></td>
</tr>
</tbody>
</table>

25
Figure 7 gives the distribution of the number of requests submitted by firms. An average of 2.3 requests was received from each firm. Over 40% of the firms submitted only one request. Also, approximately 20% of the firms submitted between four and six requests.

Figure 8 summarizes the lead organization responding to the requests. Over 80% of the requests were forwarded to federal laboratories. Also, five requests were for employee training and forwarded to AIDTraining. One request for business assistance was forwarded to the local Small Business Development Center (SBDC).

4.1.3 Publicity

A number of news releases have been prepared. One of these draft news releases has been turned into an official Chamber press release. Appendix G gives copies of these news releases.

News releases have been sent to the following organizations:

- Huntsville chapters of SLE, SAVE, SRE, SCEA, SAME, SAMPE, ISA, SAE, RI/SME, IIE, IEEE, ASPE, ASQC, ASHRAE, APICS, ASME, ASCE, and AIAA
- Huntsville Area of Technical Societies (HATS)*
- Southeast RTTC
- North Alabama Industrial Trade Association (NAITA)
- Gulf Coast Alliance for Technology Transfer (GCATT)
- Huntsville Association of Small Businesses in Advanced Technology (HASBAT)
- Alabama Small Business Development Consortium (ASBDC)
- Business Council of Alabama (BCA)
- Alabama Resource Center
- Alabama Industrial Development Training (AIDTraining)
- TVA National Fertilizer and Environmental Research Center
- Mobile, Montgomery, and Birmingham Chambers of Commerce
- Technology Transfer Society
- Alabama Society of Professional Engineers (ASPE)
- ADO/ADECA newsletter
- Technology Transfer Business
- National Technology Transfer Center (NTTC)

Those organizations with an * have published the news release. Copies of the published news releases are given Appendix D.

4.2 Birmingham Chamber of Commerce

The Birmingham Chamber of Commerce has expressed interest in establishing a similar technology transfer program to the Huntsville Chamber program. The UAH team has prepared a draft operations manual and publicity materials for the Birmingham Chamber. Current plans are to have the
Figure 7. Requests Submitted by Firms

<table>
<thead>
<tr>
<th>Number of requests</th>
<th>Percentage of firms (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10 20 30 40 50</td>
</tr>
<tr>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

26 firms
59 requests
2.3 requests/firm

Figure 8. Organizations Responding to Requests

<table>
<thead>
<tr>
<th>Organization</th>
<th>Percentage of requests (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MICOM</td>
<td>24</td>
</tr>
<tr>
<td>MSFC</td>
<td>19</td>
</tr>
<tr>
<td>SSDC</td>
<td>3</td>
</tr>
<tr>
<td>TVA/NFERC</td>
<td>3</td>
</tr>
<tr>
<td>AIDTraining</td>
<td>5</td>
</tr>
<tr>
<td>Industry</td>
<td>4</td>
</tr>
<tr>
<td>SBDC</td>
<td>1</td>
</tr>
</tbody>
</table>

59 requests

15
Birmingham program operational during January 1994. The Alabama SBDC has agreed to serve as the chair for the technology transfer action board (TTAB). Four technical requests have already been received from firms in the Birmingham area during September and October 1993.

5.0 PROBLEM STATEMENTS SUBMITTED TO MSFC

This section contains a tabulation of the problem statements submitted to MSFC from January 1992 through December 1993. Figure 9 gives the distribution of problem statements by month for 1992. Figure 10 gives the distribution of problem statements by month for 1993. The large increase in problem statements beginning in June 1993 is the result of the large number of requests for the modular manufacturing and simulation CAR.

Table II gives the distribution of the 1993 problem statements received by state. In summary:

- 64.3% of the problem statements were from states with Memorandum of Understanding with MSFC
- 351 (47.7%) of the problem statements were for the modular manufacturing CAR
- 46 (6.2%) of the problem statements were for the CFC replacement CAR
- 445 (60.5%) of the problem statements were assigned to UAH for close-out

Figure 11 gives the distribution of problem statements assigned to UAH for close-out for 1992. Figure 12 gives the distribution of problem statements assigned to UAH for close-out for 1993.
Figure 9. Problem Statements Submitted to MSFC During 1992
Figure 10. Problem Statements Submitted to MSFC During 1993
Table II. 1993 Problem Statements by State

<table>
<thead>
<tr>
<th>State</th>
<th>Modular Manufacturing CAR</th>
<th>CFC CAR</th>
<th>Other Problem Statements</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>76</td>
<td>5</td>
<td>118 (34.8%)</td>
<td>199</td>
</tr>
<tr>
<td>GA</td>
<td>35</td>
<td>17</td>
<td>24 ( 7.1%)</td>
<td>76</td>
</tr>
<tr>
<td>LA</td>
<td>3</td>
<td>0</td>
<td>10 ( 2.9%)</td>
<td>13</td>
</tr>
<tr>
<td>MS</td>
<td>15</td>
<td>4</td>
<td>14 ( 4.1%)</td>
<td>33</td>
</tr>
<tr>
<td>TN</td>
<td>14</td>
<td>0</td>
<td>29 ( 8.6%)</td>
<td>43</td>
</tr>
<tr>
<td>WV</td>
<td>1</td>
<td>0</td>
<td>23 ( 6.8%)</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>144</td>
<td>26</td>
<td>218 (64.3%)</td>
<td>388</td>
</tr>
<tr>
<td>Other</td>
<td>207</td>
<td>20</td>
<td>121 (35.7%)</td>
<td>348</td>
</tr>
<tr>
<td>Grand total</td>
<td>351</td>
<td>46</td>
<td>339 (100.0%)</td>
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Problem statements
- Modular Manufacturing CAR: 351 (47.7%)
- CFC Replacements CAR: 46 (6.2%)
- Other problem statements: 339 (46.1%)
- Total: 736 (100.0%)

Problem statements assigned to UAH
- Modular Manufacturing CAR: 351 (100.0%)
- CFC Replacements CAR: 46 (100.0%)
- Other problem statements: 48 (13.8%)
- Total: 445 (60.5%)
Figure 11. Problem Statements Assigned to UAH During 1992

Figure 12. Problem Statements Assigned to UAH During 1993
Appendix A

Firms Requesting CFC Replacement
Critical Area Response Package
<table>
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Appendix B

Firms Requesting Modular Manufacturing and Simulation
Critical Area Response Package
## Simulation Software Requests—State by State

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<th>COMPANY NAME</th>
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<td>Mr. Jim Tatum</td>
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<td>205/575-3231</td>
<td>205/743-7554</td>
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<td>Andover Togs</td>
<td>Mr. Billy Anderson</td>
<td>201 French Drive</td>
<td>Scottsboro</td>
<td>AL</td>
<td>35768</td>
<td>205/259-3000</td>
<td>205/259-3165</td>
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<td>Kappler USA</td>
<td>Mr. Gary Mitchell</td>
<td>P.O. Box 218/5000 Grimes Drive</td>
<td>Guntersville</td>
<td>AL</td>
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<td>205/582-2410</td>
<td>205/582-2706</td>
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<td>Valtex, Inc.</td>
<td>Mr. Paul R. Kunitz</td>
<td>205 East Avenue</td>
<td>Tuscaloosa</td>
<td>AL</td>
<td>35487</td>
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<tr>
<td>Kleintern's Inc. of Alabama</td>
<td>Mr. Van J. McLace</td>
<td>2251 Old Curtis Road</td>
<td>Tuscaloosa</td>
<td>AL</td>
<td>35487</td>
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<tr>
<td>TBE</td>
<td>Mr. Roland Woodard</td>
<td>P.O. Box 70007</td>
<td>Tuscaloosa</td>
<td>AL</td>
<td>35487</td>
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<tr>
<td>Manner Corporation</td>
<td>Ms. Julia Dover</td>
<td>P.O. Box 669 (111 S. Hoyle Street)</td>
<td>Tuscaloosa</td>
<td>AL</td>
<td>35487</td>
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<tr>
<td>USAMICOM</td>
<td>Mr. John E. Howard</td>
<td>AMSMI-LE-LE/Redstone Arsenal</td>
<td>Tuscaloosa</td>
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<tr>
<td>USAMICOM</td>
<td>Ms. Julie Creasy</td>
<td>AMSMI-RD-PCJA/Redstone Arsenal</td>
<td>Tuscaloosa</td>
<td>AL</td>
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<tr>
<td>Arrow Company</td>
<td>Riley Lawson</td>
<td>5000 Hwy 431</td>
<td>Tuscaloosa</td>
<td>AL</td>
<td>35487</td>
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<tr>
<td>University of Alabama</td>
<td>Dr. Lydia L. Roper</td>
<td>307 Doster/P.O. Box 870158</td>
<td>Tuscaloosa</td>
<td>AL</td>
<td>35487</td>
<td>205/348-6176</td>
<td>205/348-3789</td>
<td># 1295</td>
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Appendix C
Survey Questionnaire
Dear Requestor of Software:

Several weeks ago your firm requested a copy of the Apparel Modular Manufacturing software (SSE5 and SSE6 simulators) from the NASA Marshall Space Flight Center (MSFC) Technology Utilization Office.

I hope you will take the time to complete the attached questionnaire. We are very interested in knowing how this software was used by your firm and any comments you may have on improving the software.

Thanks for your help.

Sincerely,

Bernard J. Schroer
Director

BJS:hg

Attachments

09/41
NASA Technology Transfer
Industry Followup

1. Have you used the software? yes [ ] no [ ]

2. If yes, how has the software been used?

3. What effect will the software have on your firm?
   - Convert (or planning to convert) to modular manufacturing
   - Reduce operating costs Estimate $ __________
   - Increase market share
   - Increase sales Estimate $ __________
   - Improve competitive position
   - Opportunity to expand operations
   - Increase profit margin
   - Introduction of new products
   - Opportunity to hire new employees Estimate new employees _______
   - Other ___________________________

Suggestions for improving software:

Optional

Name: _______________________________
Company: __________________________
City: _______________________________

Return to: Bernard J. Schroer
           Center for Automation and Robotics
           University of Alabama in Huntsville
           Huntsville, AL 35899

Or FAX to: Bernard J. Schroer
           (205)895-6733
Appendix D

Articles Describing the MSFC TT Program
Apparel Technology
NASA is taking interest in the apparel industry as part of its mandate to transfer technology to the private sector.

by Lisa Cedrone

SPACE, THE FINAL FRONTIER?
It's not intended to be for NASA, with its mission to explore 'strange' new industries and seek out innovative applications for its vast technology base.

The undertaking of transferring space-age developments to the world of private industry has received a lot of lip service over the past few years at The National Aeronautics and Space Administration (NASA). Under the mandate of the Stevenson-Wydler Technology Transfer Act of 1980, the United States' 700 federal laboratories, which include NASA's research centers, were authorized to launch the transfer. The act was not successful in achieving its goal, but was later supplemented by additional legislation — most notably, the National Competitiveness Act of 1989 — that has, if nothing else, at least set a fire smoldering under the government's seat.

Since '89, NASA has had success in assisting some U.S. manufacturing industries in adopting and developing new technology and accessing state-of-the-art commercial applications. Most of the gains, however, have been made in related sectors, such as aeronautics — until recently. The George C. Marshall Space Flight Center in Huntsville, AL, for one, is pushing to alter the trend by reaching out to other industries, including apparel and textiles, in an effort to stimulate NASA's technology transfer mandate.

More than 650 problem statements (applications from manufacturers seeking assistance) have been received and answered by Marshall's Technology Utilization Office in the past three years. And in the past six months alone, the center has had contact with 100 apparel firms and started work on 50 apparel-related projects with Alabama companies including Kaplan USA, Russell Corp., Vanity Fair Mills and Phillips-Van Heusen.

"The reason garment industry inquiries are going up is partly due to the advent of the University of Alabama in Huntsville — Dr. Bernard Schroer, Carl Ziemke and Wayne McCain, three of the university's researchers working in the apparel sector, have joined the Technology Utilization Office under a contract with NASA — and partly as a result of an extensive county-by-county outreach effort that the state of Alabama is instigating," explains Harry Watters, a team member at Marshall's Technology Utilization Office. As the apparel industry is one of the state's strongest manufacturing sectors, it is receiving a great deal of attention during the canvassing process.

You might wonder what applications technology developed to advance the exploration of our solar system might have in an industry such as apparel. As Watters points out: "A lot of the technology we can spin off to industry you would never think is related to rocket science. But the processes, planning operations, flow on the factory floor, adaptation of robotics and automation and computer-aided design we use are all generic."

Marshall is primarily responsible for the research and development of large launch vehicles and the development and integration of payloads and experiments. The center is unique because it has the management responsibility for all of the space shuttle's launch components, with the exception of the orbiter itself. It also handles NASA's new solid rocket motor facility and the development of many unmanned payloads for space research. As a result of these obligations, Marshall has much more expertise in manufacturing than other NASA centers, such as Langley Research Center, Hampton, VA, or Ames Research Center, Moffett Field, CA. And the Alabama center is well suited to transferring technology to the private sector, having a dedicated Technology Transfer Office and seven laboratories offering expertise in manufacturing.

The laboratories' work in vision systems is one area that has good potential for transfer to the apparel and textile industries. "I think we can help provide generic, commercially available solutions to a whole bunch of vision system problems of automatic sewing machines," points out Ziemke. Marshall has worked extensively in developing vision systems and sensor technology for welding air-conditioner compressors and has had contact with

Simulation and related computer technology, both which have numerous applications in sewn products manufacturing, are areas in which NASA has a wealth of information.

Bobbin, March 1993 43
Reaching Out

Bringing out to secondary applications has not been one of NASA's overall strengths, according to a recent NASA report prepared by the Special Initiatives Team on Technology Transfer, which was chartered last May. The self-evaluation, released by NASA administrator Daniel S. Goldin in January, revealed the organization's limited technology transfer success, saying that the process has been too slow to meet U.S. industry needs and that NASA employees, managers and contractors often do not believe technology transfer is part of their jobs.

Marshall began addressing these problems in 1989, when the center started an extensive outreach program. During that year, it signed technology transfer "Memoranda of Understanding" with the states of Alabama, Tennessee, Georgia, Mississippi, Louisiana and West Virginia. Under these agreements, Marshall has undertaken cooperative efforts with local chambers of commerce, economic development organizations and educational institutions in each of the six states to solve industry problems.

"We have interpreted these memoranda as meaning that we need to assign a person to concentrate on each state, to get to know the state and its industries and what their technical requirements are," says Harry Watters, a team member at Marshall's Technology Utilization Office.

Seventy percent of Marshall's technology transfer efforts are concentrated in these states, although the center is not limited in its reach and it has answered requests for help from 46 states to date. According to Ismail Akbay, director of the Technology Utilization Office, "We have other states asking us to reach into their areas — as far away as Maine, Connecticut, Arizona and the Carolinas. We are now evaluating our work load to determine how we will be able to take on additional projects."

There's little doubt that technology transfer will take on new importance in NASA's agenda, opening up new opportunities for industry. The Special Initiatives Team on Technology Transfer report specifically calls for major improvements in the way technology is disseminated and offers recommendations for changing NASA's culture. Marshall, for example, is already looking at increasing the number of states in which it has dedicated representatives. Resources are a limiting factor, but the renewed emphasis the organization is placing on technology transfer is a step in the right direction.

As an example of Marshall's work with industry, technology utilization officials point out the world's first fiber placement system, which was developed through a joint venture between Marshall and private industry.

Left to right, Ismail Akbay, director of Marshall's Technology Utilization Office, Dr. Ken Fernandez, outreach manager and Neil Massey, manager of contract compliance.

According to Dr. Ken Fernandez, technology transfer outreach manager, it's one of the organization's most sought after licenses. However, NASA is not in the business of getting rich from patents, he points out. "In many cases, NASA is mainly interested in pushing the technology out the door," emphasizes Fernandez, "so the licenses are priced very reasonably." The point is to try to get private companies to commercialize the technology, especially if it has potential to help industry.

Simulation and related computer technology, both which have numerous applications in sewn products manufacturing, are other areas in which NASA has a wealth of information. There is even an apparel-specific simulation program for modular manufacturing environments available free for the asking at Marshall. Developed by Schroer under contract with NASA, the program has been utilized successfully by several Alabama companies, including some that otherwise would not have the resources to develop or purchase such a manufacturing tool. Kappier USA, a Guntersville, AL-based manufacturer of protective apparel and related garments, for one, has successfully used the program to assist in converting 90 percent to 95 percent of its operations to modular, says Gary Mitchell, senior engineer at the company's Guntersville plant.

The simulation program is...
a typical example of free or inexpensive, readily available technology. You might even be pleasantly surprised to find it won't cost you an arm or a leg if you decide to seek NASA's assistance. For example, Marshall offers free technical assistance for solving specific problems; database searches on new technologies, patents and information on competitors, etc., for a small search fee; the COSMIC software library of 1,200 programs developed with NASA funds (programs available through the University of Georgia for a small fee); and NASA Tech Briefs magazine, a free monthly publication containing short abstracts describing NASA-developed technologies.

Moreover, getting involved in Marshall's technology transfer program is not complicated. Technical assistance, for example, can be initiated by filling out a one-page problem statement form.

"It is a very simple process," says Fernandez. "Someone from a private company does not have to compose a long-winded letter and send it to an anonymous organization. The process is designed to be streamlined. You can even fax it in a problem." Problem statements are reviewed weekly by Marshall's Technology Applications Board. "Generally, if we determine we have a chance at helping a company, we will send an immediate response back saying the inquiry has been assigned a problem statement number," says Fernandez. An answer may be readily available through technologies already investigated or developed by NASA. If not, the problem is routed to the appropriate technical laboratory and personnel at the center. Or the problem could be referred to another center.

In many cases, a problem statement will not provide sufficient information for NASA to begin researching a solution. In these instances, NASA typically invites representatives from the company to come to the center and meet with technologists, or asks the company to mail more detailed information. Visitors are required to pay their own travel expenses, but there is no additional fee levied by NASA for the visit.

For the average problem, the Technology Utilization Office aims to provide an answer in 60 days. And requests such as software often can be answered immediately. If there is not an off-the-shelf solution for a company's problem, NASA may enter into a long-term project with the company to develop or modify a technology. This is typically done on a shared-cost basis with the manufacturing company.

"The company puts up resources to come down and work with us," adds Fernandez. "and we provide access to the laboratories. In other cases — if we have a unique resource that is not available on the commercial market — we would allow industry to come in on a reimbursable basis to work with us and develop the technology."

However, NASA does have some ground rules. It does not attempt to compete with providers of existing commercial products or private consultants. "If it is a straight engineering type task where the company says it needs to figure out how much lighting is needed in an area," for example, says Fernandez, "we would consider it something that any number of private consulting firms should address." Neither will NASA offer product reviews of existing technology, though researchers will talk about general success with a generic technology.

In developing or adapting technology applications, NASA has engaged in several projects with the apparel and textile industries. At one large vertical Alabama manufacturer, for example, several generic industry problems are being discussed, and NASA experience in sensor and measurement technology is being applied. In another case, the company asked NASA for information on ways to examine bales of cotton for metal impurities prior to processing. These metal pieces typically break off of farming equipment and can cause dust explosions or mechanical damage when sucked into fiber processing equipment. Once a bale of cotton is opened, it is difficult to return the bale to the supplier, so the objective is to find a way to examine the bales prior to opening.

Technical suggestions given to a company typically require that new equipment be purchased and integrated into an existing process. This
Many small and medium size private companies receive assistance through the George C. Marshall Space Flight Center’s outreach program. Inquiries from the private sector cover a range of technical disciplines, most of which are related to manufacturing.

<table>
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<tr>
<th>Technical Inquiries by Discipline</th>
<th>1990 - 1992</th>
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<tr>
<td>Materials</td>
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<td>Process Engineering</td>
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<td>Electrical/Electronics</td>
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<td>5%</td>
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<tr>
<td>Miscellaneous</td>
<td>5%</td>
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is not always feasible, and in instances such as the cotton bale inspection equipment, the partnership has not materialized an answer yet. Even if a technology is adapted, evaluation time is then required before most problems can be deemed as solved. For instance, several sensing and measurement devices currently being used by this apparel company, based on NASA recommendations, will take several weeks to evaluate. In addition, long-term, generic problems, such as the control or elimination of static electricity in the manufacturing process, are ongoing concerns which may never be totally eliminated.

It's too early to say whether all or any of the NASA suggestions will prove feasible in applications at apparel companies.

NASA is by no means a magical source of answers. It takes commitment and resources from both sides to make a project successful.

However, “If something generic works, it’s not only the solution for one company, but the solution for many companies,” believes Ziemke. None of the generic technologies recommended or developed by NASA are proprietary; any company has access to the information. That’s not to say that NASA won’t respect the confidentiality of a company’s research efforts. Marshall’s researchers, for example, will agree not to disclose company-sensitive information encountered while working with a manufacturer. For Kappler USA, this policy made its executives comfortable with establishing a NASA partnership to improve the properties of a disposable garment fabric. While it is still too early to predict the outcome, the end result of such a cooperative effort may be a shared patent between industry and NASA if a unique process for improving the product is jointly created based on a new NASA concept.

So the countdown for technology transfer is on, and getting in on the ground floor of these efforts may prove an advantage for apparel manufacturers. But in the long run, if the sewn products industries want to reap the benefits of NASA’s expertise, the weight of the burden cannot rest solely with the government. “One of the lines that we use is, ‘Tech transfer is a contact sport,’” says Fernandez. “While it’s great to have magazines that document everything we’ve done from a technical nature, we find that going out and directly meeting with industry and making visitations at plants is necessary.”

Indeed, if technology transfer is to truly blast off, initiatives from manufacturers will not only be necessary, but imperative.

Lisa Cedrone is technical editor of Bobbin.
An Intimate Look
Private Label Lingerie Takes Off, p. 28

1993 Salary Survey, p. 22
EDI Update: Electronic Commerce, p. 36
Theory of Constraints, p. 42
WAM '93 Review, p. 54
Simulation Program Lets Users Try Modular Before They Buy

Sewn products makers can see how modular will affect their production via NASA-developed simulation software. — by Colleen Moynahan

If you’ve been considering a modular manufacturing system but are unsure of its feasibility, NASA may be able to help you — for free.

As part of the NASA Technology Transfer Program, researchers at the University of Alabama-Huntsville and the Marshall Space Flight Center have developed a simulation program that assists in the design and evaluation of modular manufacturing systems via computers.

"Basically, it’s for companies that want to convert from the old progressive bundle system to modular," says Bernard Schroer, UAH, chairman of the Industrial and Systems Engineering Department. "It lets them design and analyze the module without making the actual investment."

The software program will run on most personal computers with a VGA monitor. Users simply input information such as number of stations, machines and standard time for each operation, and the system constructs a simulation.

"It will show where the line is unbalanced because the work-in-process will pile up," says Schroer.

Three different programs, depending on the modular style, are included on disk. For instance, the SSE#6 simulation program, which is based on the Toyota Sewn Products Management System, includes the following operation characteristics:

- Work done in lots of one part.
- One line with a maximum of 18 stations (all stations in a series).
- Each station may have up to eight machines with each performing the identical operation.
- All operators are cross-trained and able to work at any station at similar efficiency.

Some manufacturers are using the program to check their modular plans before implementation. Others, who still may be investigating modular, use the program to form such plans.

- Maximum of 26 operators.
- Unlimited space for work-in-process in front of each station.
- Always enough items (WIP) in front of the first station so there is never a delay waiting on an item.
- No machine breakdown.
- Both the first and last stations must consist of only one machine.

The SSE#3, however, has different operation characteristics, including work done in lots of one or more. The programs also differ in the rules that govern operator movement. For example, in SSE#6 (the TSS-modeled program), operators move counterclockwise with a part until they reach a station already occupied by an operator. The part is either placed in front of the station or passed directly to the operator.

In the SSE#5, (the more common modular style) operators attempt to move to another station in the priority list once they have either reached their time limit at the station or when they have completed a garment lot.

"It just depends on the type of modular system being used," said Schroer. "Most manufacturers have modular set ups similar to the SSE#5 program." About 50 companies already have requested copies of the program. Schroer says most users can become proficient in the use of the system with an hour of training.

Some manufacturers are using the simulation program to check their modular plans before implementation, says Schroer. Others, who may still be investigating whether to go modular, use the program to form such plans.

U.S. companies may request a copy of the free program, which includes two disks and a manual, by calling (205) 544-2223, or faxing a request to (205) 544-3151. —
Plant Manager Wanted

Quality shirt and pant manufacturer seeks professional to manage a 300 machine sewing plant located at Ponce, Puerto Rico. Expertise in all aspects of cut, sew, training, production, quality control, engineering; proven record of work within budget and of meeting deadlines. Bilingual (English/ Spanish). Commensurate salary plus excellent performance bonus. Send resume and salary history to:

Human Resources Manager
Life Mfg. Corp.
P.O. Box 1178
Caguas, Puerto Rico 00726

or leave message at AACA booth for appointment in Atlanta during Bobbin Show.

Job Candidates

Contact Wayne Wilson, Wilson & Associates, 813 796 4955.

#1082 - Plant Manager/Sewing Manager, 30 years exp. in knits

#3058 - Head Mechanic, Southeast, 20 years exp. in knit/woven

#1161 - Contract Manager, bilingual, 18 years exp., degreed

#3919 - Cutting Room Manager, men's and women's knits, woven, and fleece up to 120,000 dozen per week

#3818 - Director of Merchandising and Product Dev., world traveled, sourced knits/wovens

#3883 - Director of Development and Processing for large 4 plant operation, SPC in fabric and dye finish

#3912 - Plant Manager, engineering background, bedding, quilts, 19 + years exp.

#3896 - General Manager home furnishings, 20 years exp., engineering background

#3914 - General Manager, curtains and drapes, 20 years production experience, computers

#3849 - Warehouse/Distribution Manager experienced with computer systems

#3761 - Quality Manager with over 30 years exp. as a master tailor

#1304 - Industrial Engineer with over 20 years exp. with knit and woven children's wear

Wanted

Any quantity of branded clothing wanted; irregulars and closeouts - Jeff Mast, Jarel Ent. 609 589 5277. *Jarel is now supplying our members' outlet stores with branded clothing as well.

Commercial

Thread - We BUY, SELL/TRADE; all colors, types and sizes; elastic and related products, too. Turn your excess inventory into $$. Call Jacqui (purchasing) or Lori (sales) at 800 723 1214.

Modular Manufacturing Software

NASA's Marshall Space Flight Center (MSFC) has developed simulation software for studying modular manufacturing systems. The software can simulate modules with stand up and sit down operators. The software includes a user manual. For a free copy of the software call MSFC at (205) 544 2223 or FAX your request to (205) 544 3151.

American Apparel Contractors Association
P.O. Box 720693
Atlanta, GA 30358

FIRST CLASS POSTAGE
Cleaning Alternatives. The Man-Gill Chemical Co. has been providing technical expertise at educational seminars where aqueous cleaning equipment as a replacement for traditional solvent-based cleaning systems are discussed. The seminars were created to inform companies of the environmental compliance issues involved in replacing solvent cleaners and current options available. The schedule of seminars is updated monthly: for dates and locations contact the company at (800) 627-6422 or fax (216) 486-1214.

CFC Replacement Guide. Many machine shops face problems involved with mandatory elimination of CFCs and other ozone-depleting solvents. To assist manufacturers with such problems, the NASA Marshall Space Flight Center has produced a 631-page handbook that discusses the regulatory aspects of solvent replacement, with product data on acceptable replacement solvents, including aqueous and semi-aqueous based cleaners, alcohol and particle-blast systems. Copies can be obtained at no charge by requesting the “CFC Replacement Critical Area Response” at George C. Marshall Space Flight Center, Technology Utilization Office, Code AT01, Huntsville, AL 35812, telephone (205) 544-2223, fax (205) 544-3151.

Jig Grinder Service. An independent service company, NASA Machine Tools, Inc., is now offering field service on all types of Moore jig grinders, including conventional and CNC models. The company can perform mechanical and pneumatic servicing, hand scraping, geometry corrections, laser testing, complete rebuilds to new machine specifications, precision air spindle rebuilding to include dynamic balancing, new bearings shaft replacement and other services. For more information, contact the company at 1B Frasetto Way, Lincoln Park, NJ 07035, telephone (201) 633-5200.

Metrology Grants. Brown & Sharpe Manufacturing Co. has awarded metrology equipment grants to 25 schools throughout the United States in the company’s sixth annual Excellence In Metrology Education Grant Program. This year’s awards, the most ever granted since the program began in 1988, were presented to 18 colleges and universities, two community colleges, and five technical schools located in 15 states and the District of Columbia. The awards are used to defray the cost of acquiring B&S metrology equipment including the MicroVal personal CMM, Leitz measuring microscopes, and the MicroVal PFx personal flexible gage, a desktop computer-controlled CMM.

Spindle Repair. GMN Whiton Spindle, located in Farmington, Connecticut, has opened a rebuild and repair facility to service its West Coast customers. The facility, located at 369 S. Acacia Ave., Fullerton, CA 92631, is equipped and staffed to perform repairs on ball and roller bearing spindles up to approximately 250 pounds, 24 inches long, and 14 inches in diameter. Call (800) 795-7811 for details.
NASA's Role in Apparel Manufacturing Simulation
by
Carl Ziemke and Ismail Akbay

In the June 1993 issue of Apparel Manufacturing, readers became aware that the NASA Marshall Space Flight Center (MSFC) in Huntsville, Alabama was offering a free Modular Manufacturing and Simulation data package that would permit manufacturing to simulate modular manufacturing processes on ordinary PC microcomputers without buying software or paying for specialized operator training. The response to this offer was exceptional but undoubtedly many requesters wondered why a major NASA propulsion center developed such expertise in software aimed primarily at the apparel manufacturing industry. The answer lies in the long-time MSFC association with the University of Alabama in Huntsville (UAH) and the many MSFC/UAH joint research projects accomplished over the past 30 years.

Between 1989 and 1992, UAH engineers were chartered by the State of Alabama Department of Economic and Community Affairs to conduct a technology transfer program in support of the state apparel manufacturers. At approximately the same time, UAH engineers were under contract to MSFC to jointly develop advanced simulation software. As university researchers became aware of basic problems in the apparel manufacturing industry, they observed that considerable effort was being expended to overcome the limitations of the traditional "progressive bundle" manufacturing method in favor of some faster, higher quality, more flexible systems such as Unit Production Systems (UPS) and modular manufacturing.

It soon became apparent that apparel manufacturers were having difficulty evaluating and/or adopting UPS and modular manufacturing systems. The difficulty was the general use of spreadsheets or "cut and try" approaches to implement these systems for a given style or type of garment. What was needed was a "try before you buy" computer simulation system that would allow a check of an apparel production layout before it was implemented on the sewing floor.

The UAH engineers reviewed the MSFC-funded simulation software program and found that it could be adapted to planning both UPS and modular manufacturing apparel production systems. Subsequently, this simulation software was used to analyze UPS and modular manufacturing systems in several Alabama apparel plants.

In June 1992, the same UAH engineers obtained a technology transfer contract with the Technology Utilization Office (TUO) of the Marshall Space Flight Center. The TUO is a leading pro-active organization that has served over 1,000 clients in the last four years. Recently, it was determined that the TUO would give special emphasis to meeting critical tech-transfer needs of its target southeastern clientele. In this area, apparel manufacturing is a major industry and also is one that is interested in converting to modular manufacturing. Thus, the MSFC TUO directed UAH to develop a Critical Area Response package on Modular Manufacturing and Simulation. This data package was to be offered at no cost to all U.S. citizens or firms that would request it. This decision represented a breakthrough in technology transfer because the State of Alabama did not have the resources or inclination to provide such data on a nationwide basis.
A description of the simulation data package is in order. It was developed to enhance the adoption and use of the modular manufacturing concept. This concept involves the use of dedicated, cross-trained, self-directed work groups to produce a finished product or at least a major sub-assembly of a product. These work groups are often given specialized names such as "modules", "clusters" or "teams". Use of the modular manufacturing concept can provide:

- Shorter product throughput times
- Greatly reduced work-in-progress
- Higher product quality
- Greater product flexibility
- Increased plant productivity
- Reduced employee turnover/absenteeism

Computer simulation of modular manufacturing can be very useful in its adoption. "Basically, it's for companies that want to convert from the old progressive bundle system to modular", says Dr. Bernard Schroer, Chairman of the Industrial and Systems Engineering department at UAH and leader of the simulation software development. "It lets management design and analyze the module without making the actual investment". Once the computer simulation model of a proposed production module has been formulated, it can be tested in a few minutes of PC computer time to determine its effectiveness. Numerous options can be tested in a "what if" manner in a relatively short time to determine their effect on productivity.

Despite the obvious advantages of computer simulation of modular manufacturing processes, barriers exist, especially for the smaller apparel manufacturers. Normally, such firms would have to purchase an expensive computer simulation language. Next, they would have to hire or train a skilled employee to learn the software and then develop, verify and validate simulation models. To overcome this problem, MSFC and UAH have developed software that can automatically generate the simulation code. This software is provided on two diskettes in the free data package now available from the MSFC TUO.

The reason that computer simulation is important in the design of production modules is that these modules may contain four to twenty operators who work within groups of workstations that can exceed the number of operators by 50% or more. Operators move between workstations in response to several dynamic cues such as the number of garment pieces accumulating ahead of a given workstation. Usually, several combinations of operations and machines can be proposed to produce a given product. The optimal arrangement is seldom obvious but can be derived by computer simulation.

The data package offered by MSFC includes two diskettes containing three different programs. Also included are instructional manuals and seven recent journal articles by UAH authors that deal with the implementation of modular manufacturing and its simulation in the apparel manufacturing industry. This data package consists of 132 pages of information.

The three computer programs provided, SSE#3, SSE#5 and SSE#6, allow different approaches to the design of manufacturing modules. The SSE#3 program is based on work done in lots as few as one unit and has some unique work rules. In the SSE#6, (modeled after the commercial TSS program),
operators move counter-clockwise with a part until they reach a station already occupied by an operator. Then the workpiece is either placed in front of the station or passed directly to the operator.

In the SSE#5, (the more common modular style), the operators attempt to move to another station in the priority list once they have either reached their time limit at the station or when they have completed a garment lot. Choice of programs depends on the type of modular system manufacturers have chosen. Most manufacturers use programs similar to that of the SSE#5 program.

The Modular Manufacturing Simulation data package has been provided primarily to small manufacturers. However, it has also been requested by large firms such as Vanity Fair, Haggar and Playtex. It has been sent to firms that manufacture textiles, thread, boots, shoes, leather gloves, automobile seat covers and golf bags. Over 200 copies have been requested and it can still be obtained by faxing a request to (205) 544-3151 or addressing a written request to:

National Aeronautics and Space Administration (NASA)
George C. Marshall Space Flight Center
Marshall Space Flight Center, AL 35812
ATTN: AT01/Ismail Akbay
NASA Assistance to Machine Shop Problems

M. Carl Ziemke, P.E.

Introduction

The Marshall Space Flight Center (MSFC) in Huntsville, Alabama is one of the nine NASA field centers directed to provide technical assistance to businesses and individuals on a no-cost basis. However, as a long-established manufacturing center, MSFC is especially able to assist machine shops. This assistance in solving technical problems is not limited to Alabama and neighboring states. Of course, if the client needs to visit MSFC from a considerable distance, travel costs can be a factor.

The free assistance is possible because of a series of legislative acts beginning with the Stevenson-Wydler Technology Transfer Act of 1980 and ending with the National Competitiveness Technology Transfer Act of 1989. The net effect of this legislation is to empower NASA centers, as well as other government laboratories, to provide free technical advice to U.S. citizens and industries. In some cases, NASA engineers or scientists will visit client’s facilities to better understand the problems. Also, NASA facilities can be used for problem-solving. In a few cases, the problem-solving effort turns into a special project wherein NASA/MSFC puts significant money, manpower and materials into the effort.

How the System Works

At the Marshall Space Flight Center (MSFC), technology transfer outreach is directed by the Technology Utilization Office (MSFC/TUO). This organization is headed by Mr. Ismail Akbay. His office operates as shown in Figure 1. It may be seen that the Technology Utilization Office (TUO) has special agreements to operate in Alabama and five neighboring states. Consequently, over 70% of all work is done in these six states. Technical inquiries arrive directly from the private sector or by referral from other federal organizations. Most clients use a standard MSFC form called a technical request/problem statement, but this is not mandatory. All these requestor’s input flow to the Technology Assistance Board (TAB). This board is comprised primarily of engineers from MSFC and its contractors, who number about 2,400.

As shown in Figure 1, inquiries may go to various destinations, depending on their nature. Most requests are sent to MSFC Science and Engineering Laboratories or to major MSFC contractors such as Rockwell International or Boeing. Additional destinations could be other NASA field centers or other federal labs. Note the feedback loop to the TAB and the alternate route of new technology disclosures. These are relatively rare because most clients (requestors) are not working with technology that is new to MSFC.
It should be appreciated that all work on technical requests is done on a non-interference basis with regular NASA projects such as the space station. Also, it may take some time to find the right person or persons to answer a particular request.

**Classification of Work**

Because the Marshall Space Flight Center is strongly involved in advanced manufacturing, requests for technical assistance accepted at MSFC have reflected this fact. This is illustrated in Figure 2. Note the concentration on materials and process engineering. Requests for data on materials often includes composites, which is a MSFC specialty. Environmental management requests often involve inquiries about substitute industrial solvents and/or disposal of waste products. Also important are requests in the areas of robotics and automation, including vision systems.

In many cases, the technical requests are satisfied by recommendation of the many types of advanced off-the-shelf hardware in use at MSFC.

**Tapping into the System**

Probably the fastest way to get technical assistance from MSFC is to contact the director of the Technology Utilization Office directly. His address is given below. Mail or FAX a request for a Technical Request/Problem Statement form. Filling this out and returning it will help speed the response process. Also, additional pages of information including drawings may be submitted with the MSFC form. Contact:

Ismail Akbay  
Technology Utilization Office, AT01  
Marshall Space Flight Center  
Huntsville, AL 35812  
Phone (205) 544-2223  
FAX (205) 544-3151
As U.S. manufacturers gear up to compete in the global market, many of them have begun to make use of NASA technology and technical assistance in their endeavors. This service has been made possible by federal legislation "opening up" approximately 700 federal labs to private industry. Pioneer legislation was the Stevenson-Wydler Technology Transfer Act of 1980, followed by additional legislation culminating in the National Competitiveness Technology Transfer Act of 1989.

The results of this legislation can be summarized as follows:

- U.S. manufacturers (and individuals) have access to license the patents and other technology in the federal labs. This includes technology developed by federal contractors,

- Federally developed patents are available for licensing to industry both on a semi-exclusive or non-exclusive basis,

- Federal patent holders can receive royalties from these patents,

- Federal employees will receive career credit for participation in technology transfer, and

- Federal laboratory facilities can be made available for use by industry.

The regulations just cited apply to all federal laboratories, although only about 130 are large enough to be effective in this effort. Among these are nine NASA field centers. Of the nine, the Marshall Space Flight Center (MSFC) in Huntsville is the most active in this effort. To date, the MSFC has received over 700 requests for technical assistance called "problem statements".

The variety of requests is extremely broad. One request involves safe removal of a bat colony from a church steeple. Others, such as those received from Hughes Aircraft, are highly technical. Most of the clients are from small to medium-sized companies. The length of time necessary to solve a problem statement varies from about one week to four months. In some
cases, laboratory experiments are necessary before a conclusion can be reached.

It should be appreciated that technology transfer activities must be done on time available from main stream projects such as the space shuttle. However, many of the 1700 engineers and scientists working at MSFC are participating in the technology transfer program. Also included are personnel from major MSFC contractors such as Rocketdyne, Boeing, McDonnell Douglas and Teledyne Brown.

All of the technology transfer efforts at MSFC are directed through one organization, the Technology Utilization Office (TUO), headed by Mr. Ismail Akbay. The MSFC/TUO also coordinates the networking efforts of several state and private organizations in Alabama, the home state of MSFC. These include chambers of commerce, public utilities and several state organizations.

As a consequence of this cooperative effort, MSFC/TUO has received more problem statements from Alabama than any other state. This office has signed Memoranda of Understanding (MOU) on technology transfer from governors of six Southeastern states. However, requests for assistance (problem statements) are accepted from all 50 states.

The processing of problem statements at MSFC/TUO is a structured process (see figure 1). Technical inquiries from the private sector are first sent to a Technical Applications Board (TAB). As shown in the figure, the TAB can make several different dispositions of the queries. The most common is to refer to MSFC Science & Engineering labs or contractors. Not shown is the fact that a few requests for assistance are refused because they are out of scope. They may be too general for action or may involve financial or business assistance. Some developments may become new technology disclosures, reported in the "Tech Briefs", "Cosmic" or "Spinoff" publications.

Review of technical inquiries over a recent 21/2 year period reveals common topics of interest to many U.S. manufacturers (see figure 2). Obtaining assistance from MSFC is a very simple process. Most persons use figure 3, a one-page, easy-to-use form. Readers may write for the "Technology Request/Problem Statement" form to:

Technology Utilization Office, AT01
Marshall Space Flight Center
MSFC, Alabama 35812
Phone: (205) 544-2223
FAX: (205) 544-3151
Transferring Technology from NASA to the Private Sector

*The Marshall Model*

January 1993
Inquiries from the private sector cover a range of disciplines at MSFC

- Mostly small-to medium size manufacturers
- Materials and processes questions most frequently asked (e.g. alloys, composites, welding, automation)

Technical inquiries by discipline 1989 through February, 1993

Materials: 24.2%
Process Engineering: 21.4%
Electrical/Electronics: 13.5%
Environmental Management: 10.2%
Products & Structures: 9.1%
Information Systems: 8.0%
Miscellaneous: 7.1%
Biomedical: 6.4%
# Technical Request/Problem Statement

Technology Utilization Office, AT01  
Marshall Space Flight Center, Alabama 35812  
Phone (205) 544--2223 Fax: (205) 544--3151

<table>
<thead>
<tr>
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<tr>
<td>Address</td>
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<tr>
<td>Phone:</td>
<td></td>
</tr>
<tr>
<td>Fax:</td>
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</tr>
</tbody>
</table>

**Company Contact Person**

## Problem Title
(brief, but descriptive title, using key words)

## Definition of Problem
(provide background, context, and description of problem)*

## Action to Date
(What have you already done to solve the problem?)

## Desired Results
(What would constitute a satisfactory outcome? What kind of response do you want: e.g. data search, recommendations, analyses, consultation?)

## Schedule
(When are results needed: are there any intermediate milestones?)

**Technology Transfer Rep.**

| Phone: ( ) |

---

*NOTES*
- Provide full, stand-alone explanation and background.
- Use additional sheets if necessary.
- Use this form to document problems with technological, rather than administrative or managerial, solutions.
- Try to avoid problems which would appear to place NASA in competition with private consultants, or with providers of existing commercial products or services.
- Do not include problems calling for a comparative evaluation of competing commercial products or services.
Appendix E

Seminar Announcements
The University of Alabama in Huntsville in conjunction with
The Huntsville Chamber of Commerce,
The Alabama Center for Advanced Technology Transfer (ACATT),
NASA's Southeastern Regional Technology Transfer Center,
and NASA Marshall Space Flight Center's Technology Utilization Office is offering a

CFC REPLACEMENT
SEMINAR

WEDNESDAY, OCTOBER 27, 1993
8:00 AM - 4:30 PM
2903 Wall Triana Highway, Suite #1
Huntsville, Alabama 35824
(205) 461-7550

A $25.00 Fee Covers Reproduction and
Lunch/Refreshment Costs

LIMITED ENROLLMENT
CALL (205) 895-6243 FOR RESERVATIONS

Topics will include discussion of the NASA MSFC TU Office CFC Replacement Critical Area Response Package (included) and presentations from industry representatives offering CFC Alternative Products and Processes.

In addition data will be presented on the following:

* Replacement Solvents
* Replacement Refrigerants
* Alternative Cleaning Methods
MODULAR MANUFACTURING AND COMPUTER SIMULATION
October 26-27, 1993

Sponsors:
University of Alabama in Huntsville
NASA Regional Technology Transfer Center
Alabama Center for Advanced Technology Transfer
NASA Marshall Space Flight Center

Course:
There is considerable interest in computer simulation within the apparel industry. Over the past three years UAH has developed a number of simulation models including:

° Unit production system for Camptown Togs in Clanton
° Modular manufacturing system for H. D. Lee in Bayou LaBatre
° Proposed modular system for Kappler in Guntersville
° Modular manufacturing system for Russell Corporation in Alexander City
° Distribution system for Andover Togs in Scottsboro

Because of the interest, UAH has scheduled another day and a half seminar on modular manufacturing and computer simulation. This is a repeat of an earlier seminar in August. Topics to be covered include:

° Steps in implementing modular manufacturing systems
° Advantages and disadvantages of modular manufacturing
° Actual implementations of modular manufacturing in Alabama firms
° What is computer simulation
° Steps in using simulation
° Simulation languages (focus on GPSS/PC)
° Case studies of simulation in Alabama firms
° Use of the SSE5 and SSE6 simulators

Attendees will get hands on training in the use of GPSS/PC and two apparel modular manufacturing simulators, SSE#5 and SSE#6 which have been developed by UAH. These simulators have been used by a number of apparel firms in designing and analyzing manufacturing modules. A number of sample manufacturing modules will be simulated using the SSE's.

Attendees will receive:
° Complete set of class notes
° Copy of handbook, "Modern Apparel Manufacturing Systems and Simulation" (450 pages)
° Copy of disk of limited version of GPSS/PC simulation system, Minuteman Software, Stow, MA
° Copies of disks SSE#5 and SSE#6 simulators for rapidly modeling modular manufacturing systems (for PC) along with user manuals

Seminar details:

DATE: October 26-27, 1993
LOCATION: Alabama Center for Advanced Technology Transfer (ACATT)
2903 Wall Triana Highway, Suite 1
Huntsville, AL 35824-1537
(205) 461-7550

TIME: October 26
Registration 8:00 - 8:30 am
Seminar 8:30 am - 4:00 pm
Lunch provided

October 27
Seminar 8:00 - 12:00 am
INSTRUCTORS: Bernard J. Schroer, P.E.
M. Carl Ziemke, P.E.

Bernard J. Schroer is Professor and Chairman of the Department of Industrial and Systems Engineering at the University of Alabama in Huntsville. He has been supporting the apparel industry in Alabama and has developed numerous simulation models. Dr. Schroer is the developer of the UAH apparel simulator software and author of the handbook, “Modern Manufacturing Systems and Simulation”.

REGISTRATION FEE: $195.00
Includes course materials, GPSS/PC software, UAH simulator software, copy of handbook, and lunch
SEMINAR: APPLICATION OF COMPUTER SIMULATION IN APPAREL MANUFACTURING

REGISTRATION

October 26-27, 1993

Name:

________________________________________

Company:

________________________________________

Address:

________________________________________

________________________________________

Telephone:

________________________________________

Registration Fee: $195 includes course materials, GPSS/PC software, UAH SSE#5 and SSE#6 software, copy of handbook, and lunch.

Return to:

Helen Garrett
Center for Automation and Robotics
Engineering Building 142
The University of Alabama in Huntsville
Huntsville, AL 35899
(205) 895-6243
FAX (205)895-6733
THE
HOLYEST
SHOW IN
TOWN

PLUS,
Two Exciting Shows Within THE Show:
International Sourcing/Contractors Section
and The Fabric Connection

Attendee Planning Information
Credit Alternatives as an Export Marketing Tool

Director: Irving Vigdor, Managing Consultant, Redwood Associates and guest speaker Barry J. Essig, Sr. Vice President, Barclays American Commercial Corp.
Audience: Finance, management, sales and marketing personnel
Level: Intermediate

Gain insights into credit alternatives, and become secure about financial issues as they relate to international marketing.

Topics covered include 99% of all usual export finance/credit transactions and how to use them to make sales. An excellent overview for all personnel involved with international trade and finance.

Embroidery: Starting Your Own Business

Director: Lance R. Sabo, President
Embroidery Trade Association
Audience: Would-be entrepreneurs, embroidery managers, small businesses
Level: Basic

This seminar will help the new embroiderer identify the various markets within the embroidery industry. It will briefly cover such topics as marketing, pricing, production and the general operation of embroidery businesses. A question and answer session will follow the presentation.

Electronic Reengineering for Quick Response

Director: Jack Shaw, President
EDI Strategies, Inc.
Audience: Business managers and technical staff responsible for EDI, Quick Response, process improvement and information systems
Level: Intermediate

This powerful apparel program discusses the Theory of Constraints (TOC) which was developed to provide a framework for managing business more effectively. Primary emphasis is placed on increasing throughput, the rate at which money is generated from sales. This is accomplished by focusing on the chain of interdependent resources, events and processes that help get a product to market.

Strategic Marketing and Merchandising

Director: Elizabeth A. Germeroth, Director, Retail Relations, The NPD Group
Audience: Senior marketing and merchandising managers in textiles and apparel and auxiliary suppliers
Level: Advanced

Quick Response and EDI partnerships are changing relationships between raw material suppliers and retailers/vendors. Gathering data from point-of-sale systems has become a proven actionable data source for manufacturers and retailers and has enormous importance in terms of developing competitive strategies. Lifestyle segmenting of the target consumer has been a key competitive strategy behind today's most successful brands and a major force within the changing retail landscape.

A leading market research firm will review current and forecasted apparel consumption trends and show participants how to use consumer and point-of-sale data to shape their product, brand, price and distribution strategies.

Synchronous Manufacturing

Director: John W. Couington, President
Chesapeake Consulting
Audience: Manufacturing executives, owners and those responsible for generating profits
Level: Intermediate

This powerful apparel program discusses the Theory of Constraints (TOC) which was developed to provide a framework for managing business more effectively. Primary emphasis is placed on increasing throughput, the rate at which money is generated from sales. This is accomplished by focusing on the chain of interdependent resources, events and processes that help get a product to market.

Modular Manufacturing by Computer Simulation

Director: Bernard J. Schroer, Director
Center for Automation and Robotics
University of Alabama in Huntsville
Audience: Manufacturing managers and plant managers
Level: Basic

Computer simulation for the design and analysis of modular manufacturing will help managers understand before they begin the process of switching to a new way to produce sewn products.

Participants can evaluate real systems in a variety of apparel plants and learn how simulation helps avoid problems.
Appendix F

Huntsville Chamber of Commerce Operations Manual
Operating Plan

Technology Transfer Subcommittee
Engineering, Science and Technology Committee
Chamber at Commerce of Huntsville/Madison County
225 Church St.
P.O. Box 408
Huntsville, AL 35804
(205) 535-2032
FAX (205) 535-2015

September 1993
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2.0 METHOD OF OPERATION  
APPENDIX A - Technology Transfer Brochure

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<td>2.0 METHOD OF OPERATION</td>
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<tr>
<td>APPENDIX A - Technology Transfer Brochure</td>
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MISSION

"To promote the efficient transfer of technology from area and local federal agencies to appropriate members of the Huntsville business community with particular emphasis on improving competitiveness, fostering business growth, and encouraging employment expansion" (October 1992).

1.0 INTRODUCTION

In the summer of 1992, Ismail Akbay, Director of the Technology Utilization Office at NASA's Marshall Flight Center, met with Larry Waller, President of the Huntsville/Madison County Chamber of Commerce to encourage a strong involvement by the Chamber in technology transfer. The Marshall Center's active and proven technology transfer program includes memorandums of understanding with the governor's of seven southern states and a Technology Applications Board to manage the responses to technical inquiries and problem statements from those states. Mr. Akbay solicited the Chamber to establish a technology transfer program to allow North Alabama firms to take full advantage of the new program.

As a result of these initial discussions, the Chamber's Engineering, Science, and Technology Committee, Chaired by Dr. William C. McCorkle, Director of the Army Missile Command Research, Development, Test, and Evaluation Center was charged with the task. Meetings between Mr. Akbay and Dr. McCorkle resulted in the organization of the Technology Transfer Subcommittee with Doug Stone, Boeing Aerospace Corporation, being named chairman.

The Engineering, Science and Technology Committee charged the Technology Transfer Subcommittee to identify approaches for the Chamber to assist its members, as well as non-members to access the technologies at the federal laboratories in North Alabama. These federal laboratories included the U.S. Army Missile Command (MICOM), U.S. Army Space and Strategic Defense Command (SSDC), NASA's Marshall Space Flight Center (MSFC) and the Tennessee Valley Authority's National Fertilizer and Environmental Research Center (NFERC).

The initial membership of the Technology Transfer Subcommittee included representatives from:

- The Boeing Company
- Marshall Space Flight Center (MSFC)
- U.S. Army Space and Strategic Defense Command (SSDC)
- U.S. Army Missile Command (MICOM)
- Tennessee Valley Authority (TVA)
- Madison Research Corporation
The approach, or model, for Technology Transfer selected by the Subcommittee was based on the very successful technology transfer model in operation at the NASA Marshall Space Flight Center (MSFC). Figure 1 outlines the Chamber's version of this model.

2.0 METHOD OF OPERATION

There is a continuing effort to keep the opportunity for technology transfer support before the Chamber's membership. Chamber newsletters keep the membership informed on the current activities of the Technology Transfer Subcommittee and success stories are featured as they occur.

In addition, the Technology Transfer Subcommittee has prepared a brochure describing the Chamber's technology transfer program. This brochure is used to publicize the program and to solicit firms to call the Chamber for site visits. A copy of the brochure is given in Appendix A.

Members of the Technology Transfer Action Board (TTAB) contact Chamber members to explain the technology transfer program and offer to visit the member's businesses to discuss specific technical problems, concerns or potential improvements. The Chamber's list of local industries is used as a source list for these contacts.

When a contact expresses interest in technology transfer, the TTAB representative schedules a site visit and then assembles a visit team. The team reviews operation at the facility to determine if there is a need or opportunity to provide recommendations for new technology applications. Problems or concerns will usually surface as a result of discussions during a walk-through of the facility. All requests for support are documented on the Technical Request/Problem Statement form shown in Figure 2.

This problem statement form provides a means of conveying information to the resources that will attempt to provide an answer to the stated need for technology. The various fields on the form are self-explanatory. It is very important to have the name and number of the company contact for subsequent follow-up by the person assigned to work the problem.

The Technical Requests/Problem Statements are then forwarded to the TTAB. Membership of the TTAB includes the technology transfer offices from
Figure 1. Technology transfer process within the Chamber of Commerce
TECHNICAL REQUEST/PROBLEM STATEMENT
Human Resource Department
Chamber of Commerce, Huntsville/Madison County
P.O. Box 408, Huntsville, AL 35804-0408
Phone (205) 535-2032 Fax (205) 535-2015

Date ____________________________

Organization/Company ____________________________
Address _______________________________________
_________________________________________________
_________________________________________________
Phone: ____________________________ Fax: ____________

Company Contact Person

Problem Title: (brief, but descriptive title, using key words)

Definition of Problem: (provide background, context, and description of problem)*

Action to Date: (What have you already done to solve the problem?)

Desired Results: (What would constitute a satisfactory outcome? What kind of response do you want; e.g. data search, recommendations, analyses, consultation?)

Schedule: (When are results needed; are there any intermediate milestones?)

Technology Transfer Rep. ____________________________ Phone: ( ) ____________

* NOTES
- Provide full, stand-alone explanation and background.
- Use additional sheets if necessary.
- Use this form to document problems with technological, rather than administrative or managerial, solutions.
- Try to avoid problems which would appear to place us in competition with private consultants, or with providers of existing commercial products or services.
- Do not include problems calling for a comparative evaluation of competing commercial products or services.

Figure 2. Technical Request/Problem Statement
each of the following federal laboratories and state organizations in North Alabama, plus engineers and business representatives from local industry.

- U.S. Army Missile Command (MICOM)
- U.S. Army Space and Strategic Defense Command (SSDC)
- Marshall Space Flight Center (MSFC)
- TVA National Fertilizer and Environmental Research Center (NFERC)
- University of Alabama in Huntsville (UAH)
- Northeast Alabama Regional SBDC
- AIDT/Alabama Center for Advanced Technology Transfer (ACATT)

The TTAB meets approximately every two weeks to:

1) Review and assign all incoming Technical Requests/Problem Statements to a focal point responsible for all activities associated with the problem statement. Figure 3 shows the standard letter sent to each firm that submits a Technical Requests/Problem Statement, denoting Chamber acceptance and identifying the responsible organization.

2) Review status of technical requests/problem statements currently open. Figure 4 shows the database created to track problem assignment and status.

3) Approve final closeout of problems when the focal point has completed planned activities. When the TTAB approves the proposed closeout, the Chamber sends the standard letter shown in Figure 5.

A follow-up letter is sent after approximately six months have elapsed since the request for support was closed. This is intended to guide the TTAB in judging effectiveness of activities.
March 18, 1993

Dear:

Your technical request problem statements, #33/Response Curve for Sagnac Interferometer, #34/Depolarization Induced Fading, #35/Depolarizing Technique, and #36 Tour of Composites Material Lab or Materials Fracture Lab have been reviewed by the Chamber's Technology Transfer Action Board.

The responsibility for responding to your request has been delegated to:

Organization:

Name:

Telephone number:

The above representative will be following up directly with you in responding to your request. Feel free to contact this representative directly concerning the status of your request. Also, the Technology Transfer Action Board will be meeting on a regular basis to review the agency's progress in responding to your request.

On behalf of the Chamber, I want to thank you for your participation in the Technology Transfer program, and I hope that you receive a satisfactory response. If you need any assistance please feel free to call me at 535-2033, or your representative at the number above.

Sincerely,

Robert J. Sampson, VP
Human Resources/Education

Enclosure: request/problem statements

/s

Chamber of Commerce • Huntsville/Madison County
225 CHURCH STREET NW • POST OFFICE BOX 408 • HUNTSVILLE, ALABAMA 35804-0408 • 205-535-2000

Figure 3. Chamber Acceptance Letter
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<th>TITLE</th>
<th>ORIGINATOR</th>
<th>VISITOR</th>
<th>TEAM ASSIGNED</th>
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<th>DATE CLOSED</th>
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<td>4/28/93</td>
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<td>Paints with High Thermal Signature</td>
<td>Fernandez</td>
<td>MICOM/Alford</td>
<td>10/13/92</td>
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<td>Fernandez</td>
<td>SSDC/Alexander</td>
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<td>Sprayable/Paintable Rust Inhibitors</td>
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<td>MICOM/Alford/McCain</td>
<td>11/10/92</td>
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<td>MICOM/Alford</td>
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<td>MICOM/Alford</td>
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<td></td>
</tr>
<tr>
<td>017</td>
<td>Improved Wiring Harness Manufacturing</td>
<td>Alfred</td>
<td>MICOM/Alford</td>
<td>11/13/92</td>
<td></td>
<td></td>
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<tr>
<td>018</td>
<td>Assistance in Establishing a CRADA</td>
<td>Alfred</td>
<td>MICOM/Alford</td>
<td>11/16/92</td>
<td>5/18/93</td>
<td></td>
<td></td>
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<tr>
<td>019</td>
<td>Continuously Variable Time Delay of RF</td>
<td>Alfred</td>
<td>NASA/McCain</td>
<td>11/5/92</td>
<td>9/2/93</td>
<td></td>
<td></td>
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<tr>
<td>021</td>
<td>Remote Melting and Piping of Pitch</td>
<td>Schroer</td>
<td>NASA/Fernandez</td>
<td>2/15/93</td>
<td>5/11/93</td>
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<tr>
<td>022</td>
<td>Molding of Asphalt Based Pitch</td>
<td>Schroer</td>
<td>NASA/Fernandez</td>
<td>2/15/93</td>
<td>5/11/93</td>
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<td></td>
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<tr>
<td>023</td>
<td>Selection of Potting Compound</td>
<td>Schroer</td>
<td>NASA/Fernandez</td>
<td>2/15/93</td>
<td>5/11/93</td>
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<tr>
<td>024</td>
<td>Virtual Reality Consortium</td>
<td>Schroer</td>
<td>MICOM/Alford</td>
<td>2/12/93</td>
<td>5/18/93</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 4. Technical Request/Problem Statement Database
March 18, 1993

Dear:

The Chamber has been notified by TVA that the response to the referenced technical request problem statement has been forwarded directly to your firm. Therefore, at this time, the Chamber's Technology Transfer Action Board is considering your request closed unless your firm desires additional assistance.

I want to thank you for your interest in the Chamber's technology transfer program and hope that the response was of value. If the Chamber can be of any further assistance, please call my office at 535-2033.

Sincerely,

Robert J. Sampson
VP Human Resources/Education

enclosure: request/problem statement

c: Chamber of Commerce Human Resources Dep.

/ls

Disclaimer
This information was received by the United States Government and is distributed by the National Aeronautics and Space Administration. Neither the United States Government nor any agency, contractor, or person acting on behalf of the United States Government assumes any liability resulting from the use of this information. In addition, neither the United States Government, or any agency, contractor, or person acting on behalf of the United States Government, does not represent or warrant that use of the information will be free from private economic rights.

Figure 5. Chamber Close-out Letter
APPENDIX A

Technology Transfer Brochure
If you have a problem and you suspect that new technology might hold the answer...

- Contact the Chamber of Commerce at 535-2032
- Arrange for a Technology Transfer specialist to visit your place of business to discuss your problem and kick off the search for an answer

OR

- Complete the form in this brochure and mail it to the Chamber of Commerce...you'll hear from us

PUTTING TECHNOLOGY TO WORK FOR YOU

A Guide to Technology Assistance

Participating federal organizations:

- NASA Marshall Space Flight Center (MSFC)
- U.S. Army Missile Command (MICOM)
- U.S. Army Space and Strategic Defense Command (SSDC)
- TVA National Fertilizer and Environmental Research Center

Participating state agencies:

- Northeast Regional Small Business Development Center
- Alabama Industrial Development Training
- Alabama Center for Advanced Technology Transfer
- University of Alabama in Huntsville

Technology Transfer Subcommittee
Engineering, Science and Technology Committee
Chamber of Commerce
Huntsville/Madison County

Telephone: 535-2032
Technical Assistance

Baffled by a technical problem? Have you talked to the experts and found no good solution? Why not ask your Chamber of Commerce? By filling out a simple form, you’ll kick off a process that will get the attention of people with the know-how to help.

Your problem will first be reviewed by the Chamber’s Technology Transfer Applications Board, which determines who can help. The Board looks for experts in the public sector...at NASA, at MICOM, at SSDC, at TVA and a host of other agencies, including the Federal Laboratory Consortium, an organization of government research laboratories pledged to transfer technology to people in the private sector.

The answer you get back will be one of several possibilities. Maybe you’ll score a direct hit and somebody will be able to solve your problem straight away. Maybe you’ll get a phone call from an engineer or scientist, suggesting something to try, or asking for more information. You might get back the results of a library search, showing you everything that’s been done lately to solve problems like yours.
Appendix G

Huntsville Chamber of Commerce New Releases
For Immediate Release
Contact: Stacy Thomas, 535-2028
Denise Brown, 535-2054

Technology Transfer Thrives in Huntsville,
Free Technology is Available

Since its establishment in late 1992, the Chamber of Commerce's Technology Transfer program has sent representatives to 27 firms requesting assistance through technology transfer.

"There is an enormous amount of technology available in the federal laboratories located in North Alabama," Bob Sampson, Chamber Vice President for Human Resources and Education, said. "And it's available for companies to utilize to enhance their competitiveness. They can put this technology to work for the benefit of their own bottom line."

Once a company makes a request for assistance to the Chamber, it is reviewed by members of the Chamber's Technology Transfer subcommittee, which then forwards it to the appropriate federal laboratory, state organization or industry for follow-up. Teams of volunteer scientists and engineers are also available for on-site visits to companies to assist with technology problems or suggestions of improvement opportunities.
"Requests for assistance have ranged from conversion of analog movies to digital, assembly line evaluation, to an alternative vapor degreaser process," Sampson said.


"Research and technology can be very costly for small and large businesses. We want to encourage companies to utilize the technology already generated by the government," Sampson said.

State organizations offering their participation in the program include the Alabama Industrial Development Training center and the Northeast Alabama Regional Small Business Development Center.

If you are interested in participating in this free assistance program or would like more information, please call Bob Sampson at the Chamber of Commerce at 535-2033.
HUNTSVILLE CHAMBER’S TECHNOLOGY TRANSFER PROGRAM - UPDATE

Since beginning its technology transfer program in late 1992, 27 firms have submitted 59 technology requests to the Huntsville Chamber of Commerce's Technology Transfer Program. Federal laboratories in North Alabama participating in the program are:

- NASA Marshall Space Flight Center (MSFC)
- TVA National Fertilizer and Environmental Research Center (NFERC)
- U.S. Army Missile Command (MICOM)
- U.S. Army Space and Strategic Defense Command (SSDC)

Local firms that have submitted technology requests to the Chamber by SIC code are:

<table>
<thead>
<tr>
<th>SIC</th>
<th>Description</th>
<th>Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>2200</td>
<td>Textile mill products</td>
<td>1</td>
</tr>
<tr>
<td>2800</td>
<td>Chemical and allied products</td>
<td>1</td>
</tr>
<tr>
<td>3400</td>
<td>Fabricated metal products</td>
<td>2</td>
</tr>
<tr>
<td>3500</td>
<td>Industrial machinery and computer</td>
<td>2</td>
</tr>
<tr>
<td>3600</td>
<td>Electronic and electrical equipment</td>
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<td>3800</td>
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</tr>
<tr>
<td>4911</td>
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<td>1</td>
</tr>
<tr>
<td>8062</td>
<td>General medical and surgical hospitals</td>
<td>1</td>
</tr>
<tr>
<td>8711</td>
<td>Engineering services</td>
<td>3</td>
</tr>
<tr>
<td>8731</td>
<td>Commercial physical research</td>
<td>3</td>
</tr>
</tbody>
</table>

Some representative technology requests that have been submitted by the firms are:

- Alternative vapor degreaser process
- CFC replacements
- Corrosive preventions coating material
- Conversion of analog movies to digital
- Assembly line evaluation
- Alternative potting material
- Coatings with thermal signatures
- Modular manufacturing technologies
- Delamination
- "Self healing" plastic
- Automatic scalloping of lace

The above requests have been forwarded to the following organizations for followup:

- 24 MICOM
- 19 MSFC
- 3 SSDC
- 5 AIDTraining
- 4 Industry
- 3 TVA/NFERC
- 1 Northeast Small Business Development Center (SBDC)

For more information on the program or to schedule a visit, call Mr. Bob Sampson at the Chamber at (205)535-2032, or fax your request to 535-2015.
Huntsville Chamber of Commerce
Technology Transfer Initiative

The Huntsville Chamber of Commerce has established an innovative program to assist firms access the vast amount of technology available in the federal laboratories in North Alabama. The federal laboratories participating in the program are the NASA Marshall Space Flight Center (MSFC), Tennessee Valley Authority’s National Fertilizer and Environmental Research Center (NFERC), U. S. Army Missile Command (MICOM), and the U. S. Army Space and Strategic Defense Command (SSDC). State organizations offering their participation include the Alabama Industrial Development Training (AIDTraining) and the Northeast Alabama Regional Small Business Development Center (SBDC).

Firms can either submit their technical requests directly to the Chamber or call the Chamber for a site visit. A team of volunteer scientists and engineers will then visit the firm and help identify potential technologies available in the federal laboratories.

The Chamber’s Technology Transfer Subcommittee meets every two weeks to review all new requests and the status of prior requests. Representatives of the Subcommittee include the technical transfer agents from the federal laboratories, local industries and universities. The technology requests are then forwarded directly to the appropriate federal laboratory, state organization, or industry, for followup.

Since the start of the technology transfer program in late 1992, 27 firms have been visited and 26 firms have submitted 59 technology requests. The technology requests have been sent to the following organizations for followup:

- 24 MICOM
- 19 MSFC
- 3 SSDC
- 5 AIDTraining
- 4 Industry
- 3 TVA/NFERC
- 1 Northeast Small Business Development Center (SBDC)

For more information on the program or to schedule a visit, call Mr. Bob Sampson at the Chamber at (205)535-2032, or fax your request to 535-2015.
HUNTSVILLE CHAMBER'S TECHNOLOGY TRANSFER PROGRAM - UPDATE

Since beginning its technology transfer program in late 1992, 27 firms have submitted 59 technology requests to the Huntsville Chamber of Commerce's Technology Transfer Program. Federal laboratories in North Alabama participating in the program are:

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<tr>
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</tr>
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<tr>
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<td>3</td>
</tr>
<tr>
<td>4911</td>
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</tr>
<tr>
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<td>8711</td>
<td>Engineering services</td>
<td>3</td>
</tr>
<tr>
<td>8731</td>
<td>Commercial physical research</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25</td>
</tr>
</tbody>
</table>

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For more information on the program or to schedule a visit, call Mr. Bob Sampson at the Chamber at (205)535-2032, or fax your request to 535-2015.
The Huntsville Chamber of Commerce's Technology Transfer Program has opened the door to technology by providing company assistance with technological needs. The principle goal of the program is to transfer technology from governmental agencies to private companies. Uniting with various organizations, the program is able to make the connection with a technology transfer team prepared to assist in locating, assessing, and commercializing technology to enhance individual competitiveness.

An array of participating state and federal organizations include experts from National Aeronautics and Space Administration, U. S. Army Missile Command, Tennessee Valley Authority, U. S. Army Space and Strategic Defense Command, and the Federal Laboratory Consortium, an organization of government research laboratories specializing in the transfer of technology to private sector companies. Technology Transfer teams are also available to visit a company to help with technology problems or suggest improvement opportunities.

Through the efforts of the Huntsville Chamber, technology success is being harnessed. Help build this success by contacting the Huntsville Chamber of Commerce at (205)535-2322 and making the connection with technology transfer.
PUTTING TECHNOLOGY TO WORK FOR YOU

Baffled by a technical problem? Have you talked to the experts and found no good solution? Why not ask your Chamber of Commerce? By filling out a simple form, you'll kick off a process that will get the attention of people with the know-how to help.

Your problem will first be reviewed by the Chamber's Technology Transfer Applications Board, which determines who can help. The Board looks for experts at NASA, at MCOM, at SSCC, at TVA and at a host of other agencies, including the Federal Laboratory Consortium, an organization of government research laboratories pledged to transfer technology to people in the private sector.

The answer you get back will be one of several possibilities. Maybe you'll score a direct hit and somebody will be able to solve your problem straight away. Maybe you'll get a phone call from an engineer or scientist, suggesting something to try, or asking for more information. You might get back the results of a library search, showing you everything that's been done lately to solve problems like yours.

Call Bob Sampson at (205)535-2032 for more information or fill out the form below and mail or fax it to the Chamber.

TECHNICAL REQUEST/PROBLEM STATEMENT

Human Resource Department
Chamber of Commerce, Huntsville/Madison County
P.O. Box 408, Huntsville, AL 35804-0408
Phone (205) 535 2032 Fax (205) 535 2015

| Date |__________________________________________________________|
| Address |__________________________________________________________________|
| Phone: | Fax: |

Company Contact Person

Problem Title: (brief but descriptive title using key words)

Definition of Problem: (describe background context and description of problem)

Action to Date: (what have you already done to solve the problem?)

Desired Results: (what would constitute a satisfactory outcome? What kind of response do you want? Is data search recommended? Analysis of consultation?)

Schedule: (when are results needed? Are there any intermediate milestones?)

Technology Transfer Rep. Phone: ________________________________

* NOTES
- Provide an exact problem description and background
- Use additional space if necessary
- Use this form to document problems with technological, rather than administrative or managerial solutions
- Try to avoid problems which would appeal to those with expertise in your industry
- Avoid problems that require the development or purchase of new commercial products or services
- Do not include problems calling for a company purchase of common commercial products or services

85
Since beginning the program in late 1992, a total of 26 local firms have submitted 59 requests for technical assistance to the Chamber's Technology Transfer Program.

Firms submitting requests include:
- MagneTek
- Morgan Research Corp
- SEMCO, Inc
- DESE Research, Inc
- Bowden Industries, Inc
- Disc Manufacturing
- Jacquard Lace Company, Inc
- MGV Manufacturing
- Lampi Corporation
- Advanced Composite Technology
- Campbell Engineering, Inc
- Lindy Manufacturing Co

The majority of the requests have come from Engineering Service firms (SIC8711 and 8731), Electronic and Electrical Equipment companies (SIC3600) and Transportation Equipment companies (SIC3700).

Over 40% of the requests have been from firms with employment of less than 50. Also, over 40% of the requests have been sent to the U.S. Army Missile Command (MICOM) and 32% to the NASA Marshall Space Flight Center (MDFC).

For more information on the program, or for a site visit, call the Huntsville Chamber at 535-2032.
### Employees

<table>
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<th>30</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>sample 26</td>
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Requests by firm employment

### Organizations

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<th>50</th>
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<td></td>
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<td>40.7%</td>
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<tr>
<td>MSFC</td>
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<td></td>
<td>5.1%</td>
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<tr>
<td>TVA/NERC</td>
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</tr>
<tr>
<td>AIDTraining</td>
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<td></td>
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Organizations responding to requests
### Firms Submitting Requests by SIC Code

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<td>3</td>
</tr>
<tr>
<td>8731</td>
<td>Commercial physical research</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>25</strong></td>
</tr>
</tbody>
</table>

### Requests Submitted by Firms

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<td>42.3%</td>
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<tr>
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<td></td>
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<td></td>
<td>19.2%</td>
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<tr>
<td>3</td>
<td></td>
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<td>19.2%</td>
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<td>7.7%</td>
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<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.7%</td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.3%</td>
</tr>
</tbody>
</table>

26 firms
59 requests
2.3 requests/firm
AIAA Represents The Aerospace Profession

The American Institute of Aeronautics and Astronautics (AIAA) is the principal society serving the aerospace profession. The Alabama-Mississippi section is 1,200 members strong and will celebrate its 30th anniversary in December (see HATS calendar).

As the nation's oldest and largest aeronautics and astronautics society, AIAA's purpose is to advance the arts, sciences and technology of these two professions.

On both national and local levels, AIAA is dedicated to raising the standards of technical excellence, productivity, professionalism, public awareness, and respect for aeronautical and astronautic technology within and outside the aerospace community.

AIAA has 36,000 members in 64 sections and 8,000 student members in 132 student branches. Over 2,500 of its members reside in foreign countries.

AIAA also has 75 corporate members. AIAA has 54 technical committees. It publishes Aerospace America, the AIAA Student Journal and six archive journals. The local section publishes a bi-monthly newsletter called HATS.

Constitution To Be Amended

HATS members will vote on amendments to the HATS constitution and bylaws at the general meeting in January. Most changes have been suggested to better define responsibilities of HATS committees and to clarify administrative processes. Members received copies of the changes at the September general meeting. For more information on the proposed changes, call the HATS office, 837-4287.

HATS Budget Approved

The HATS budget for the fiscal '94 year was approved at the September general meeting. It went into effect Oct. 1. Disbursements for the year are set at $68,565 with receipts set at $71,545. Of the receipts, $53,000 is expected to be raised through TABES '94.

AIAA Supports Student Events

The Alabama-Mississippi Section of the AIAA will sponsor two upcoming student activities. In February, AIAA will launch the next SOAR (Sub-Orbital Academic Research) rocket, a 4-inch diameter, 15-pound sounding rocket that propels about three miles high over

Tech Assistance Available

Since its establishment in late 1992, the Technology Transfer program coordinated by the Huntsville/Madison County Chamber of Commerce has assisted 27 companies through technology transfer.

"There is an enormous amount of technology available in the federal laboratories located in North Alabama," said Bob Sampson, Chamber vice president for Human Resources and Education. "And, it's available for companies to utilize to enhance their competitiveness. They can put this technology to work for the benefit of their own bottom line."

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State organizations offering their participation in the program include the Alabama Industrial Development Training Center and the Northeast Alabama Regional Small Business Development Center.

For more information on this free program or to volunteer to assist in this Chamber activity, call 535-2033.