CAR No: 94-02

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).

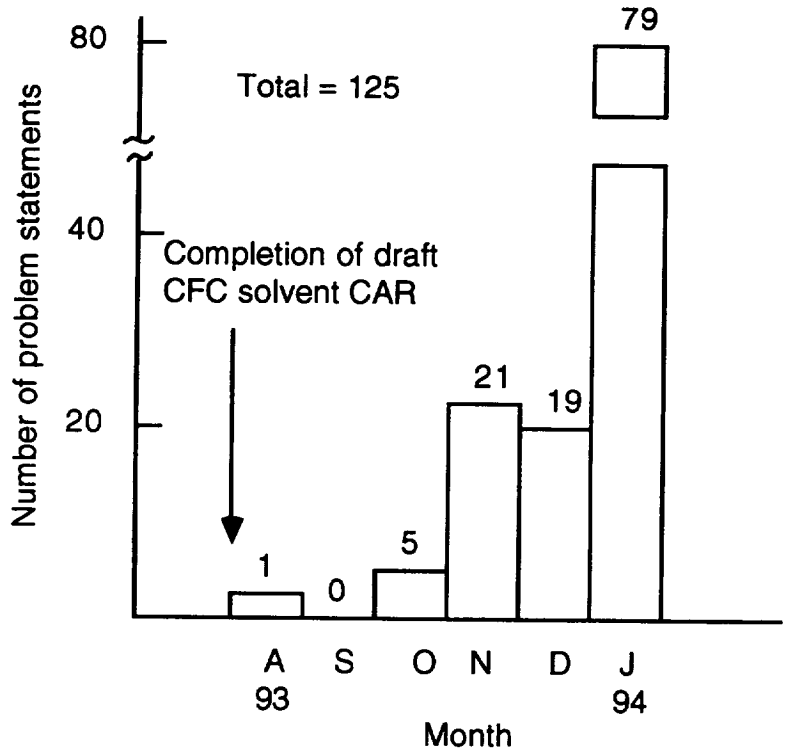


Figure 1. Requests for CFC Replacement Critical Area Respone Package

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 specfic 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 implementaton
- 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 atttempt 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 fired 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 questionnarie is given in Appendix C. A total of 227 firms were sent copies of the questionnaries.

In summary:

- 227 questionnaries 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

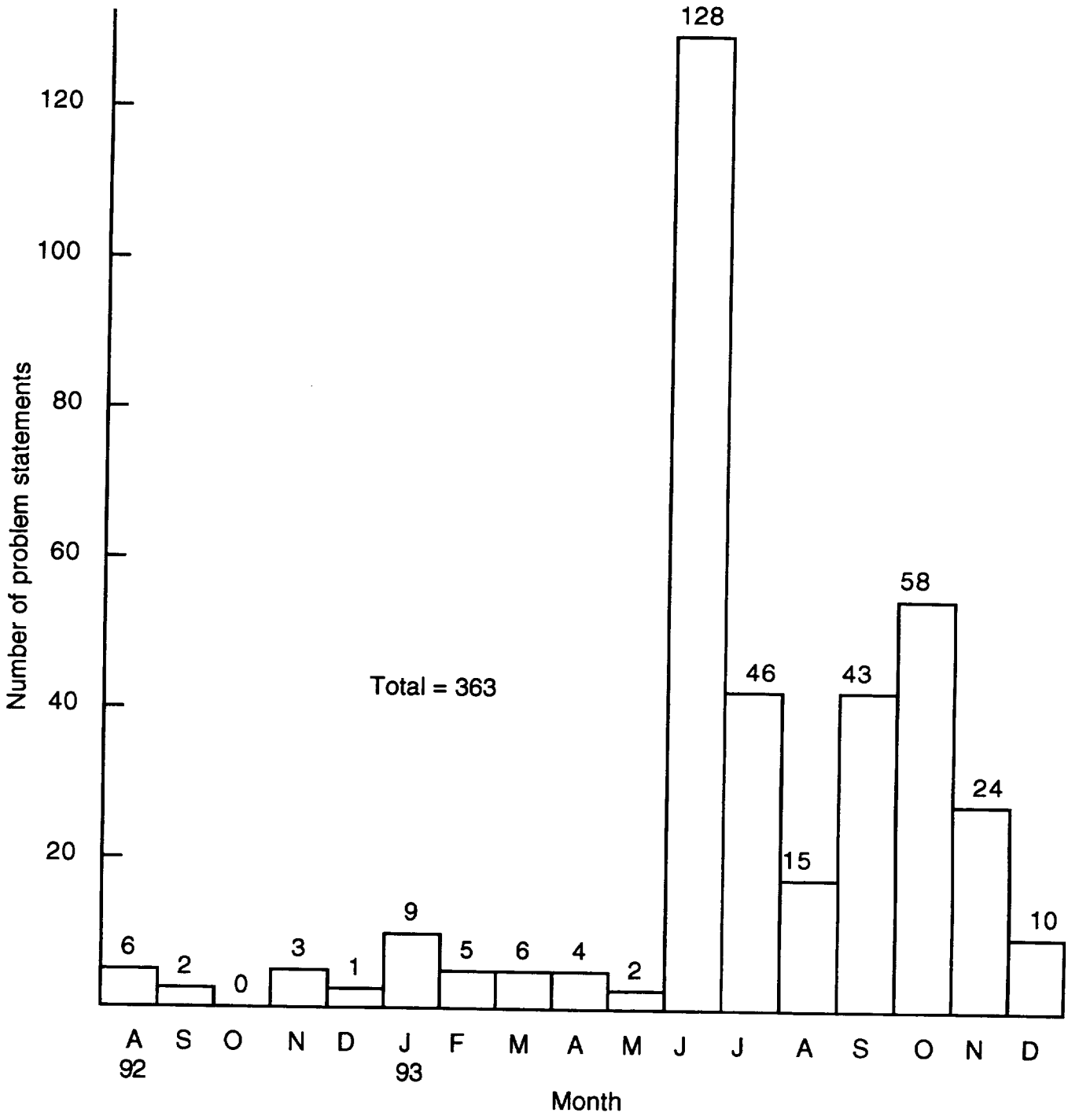


Figure 4. Request for Modular Manufacturing Simulators

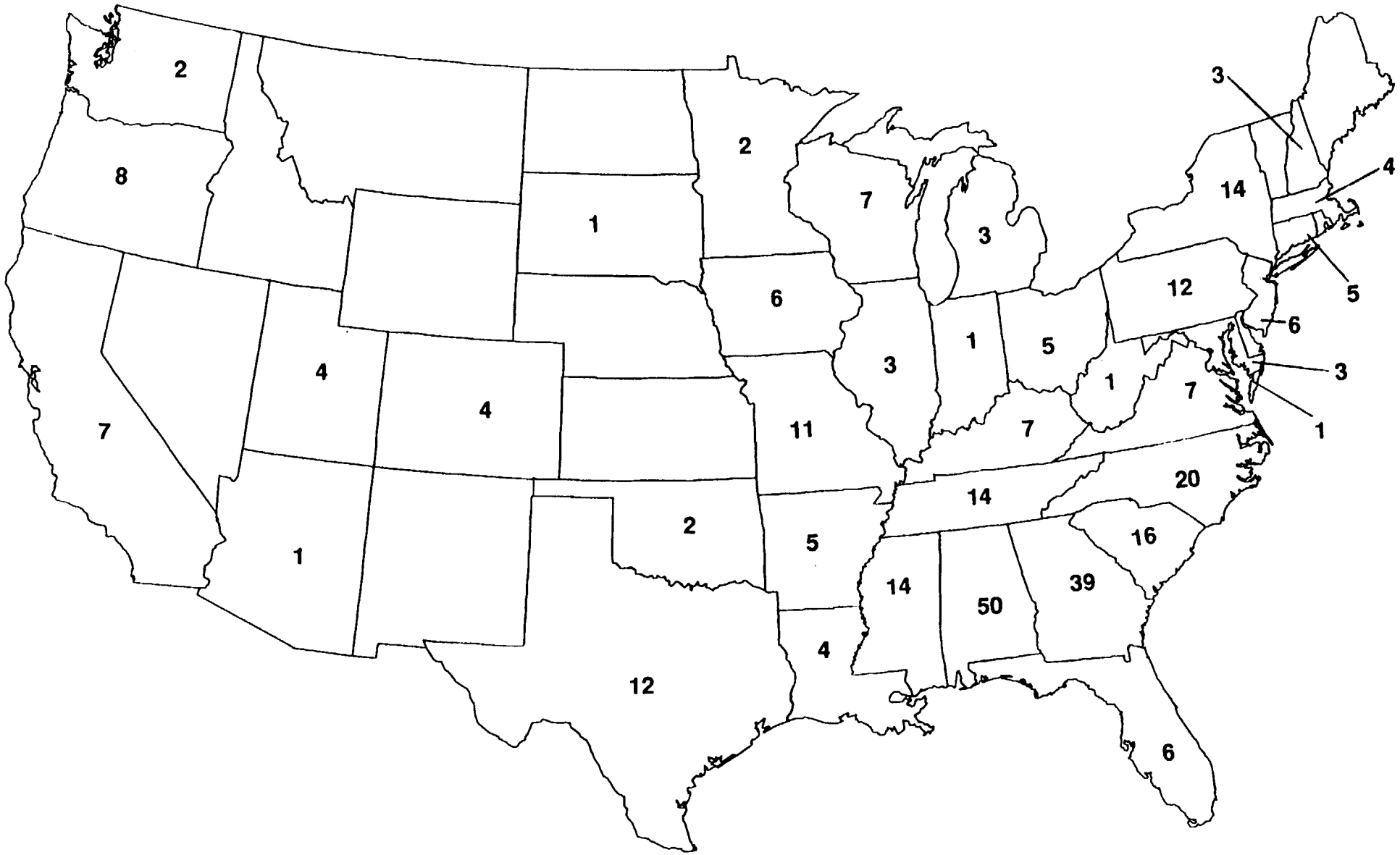


Figure 5 Requests for Modular Manufacturing CAR by State

- 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:

	Responses	%
• Convert (or planning to convery to modular	12	44%
• Reduce operating costs	9	33%
• Increase market share	2	7%
• Increase sales	2	7%
• Improve competitive position	8	30%
• Opportunity to expand operations	3	11%
• Increase profit margin	5	19%
• Introduction of new products	4	15%
• Opportunity to hire new employees	1	4%
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 Mangazine 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 Chamber of Commerce: A New Proactive Factor in Technology Transfer, submitted to the Journal of Technology Transfer, B. Schroer, M. Ziemke, and R. Sampson

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 areospce 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.

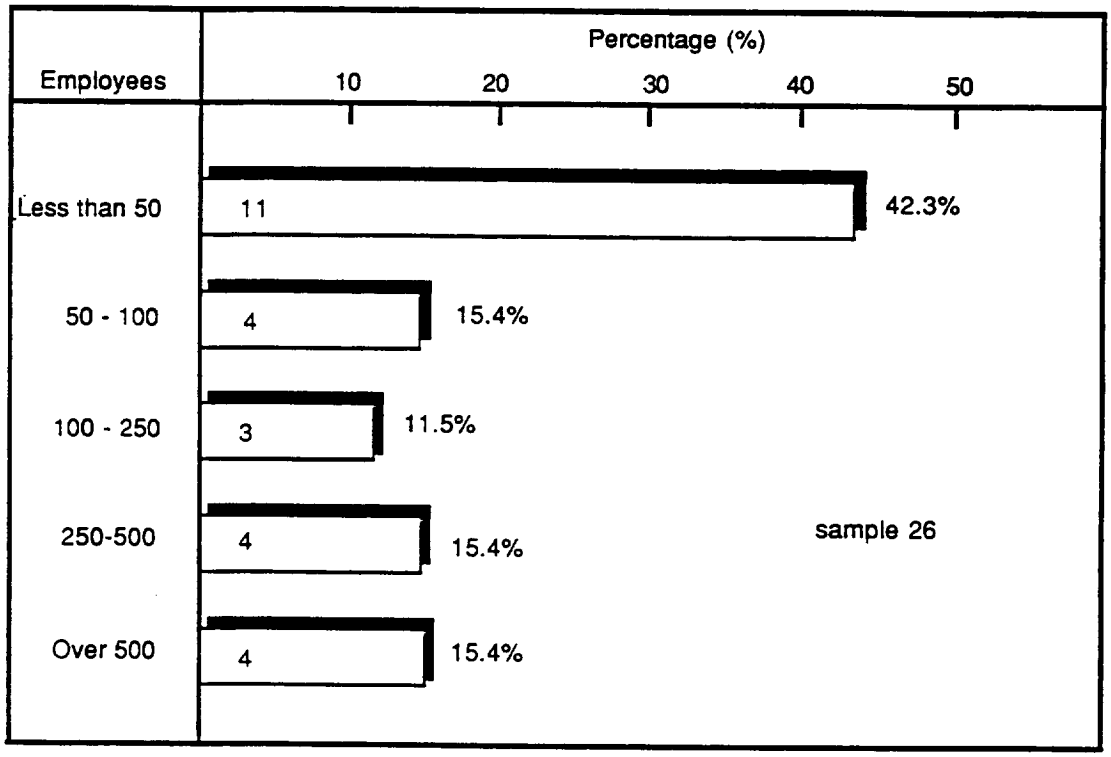


Figure 6. Requests by Firm Employment

Table I. Firms submitting requests by SIC code

SIC	Description	Number of firms
2200	Textile mill products	1
2800	Chemical and allied products	1
3400	Fabricated metal products	2
3500	Industrial machinery and computer	2
3600	Electronic and electrical equipment	4
3700	Transportation equipment	4
3800	Measuring and controlling instruments	3
4911	Electric services	1
8062	General medical and surgical hospitals	1
8711	Engineering services	3
8731	Commercial physical research	3
		25

Figure 7 give the distribution of the number of requests submitted by firms. An average of 2.3 requets 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 Tranfer 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

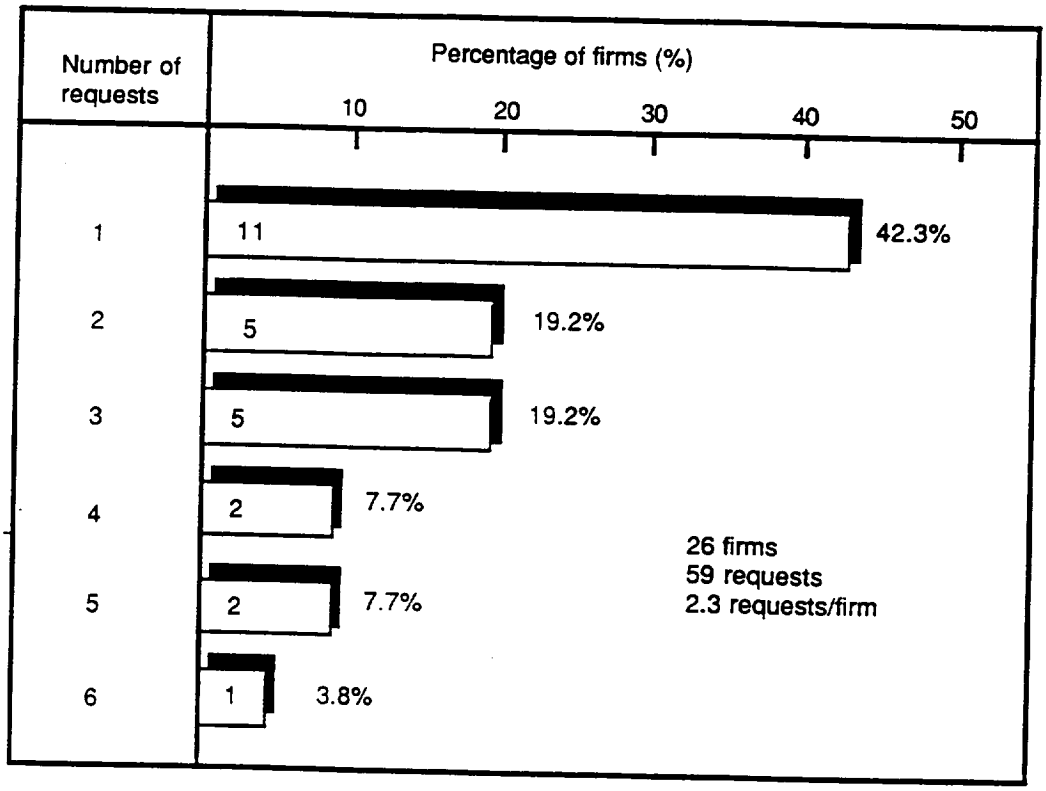


Figure 7. Requests Submitted by Firms

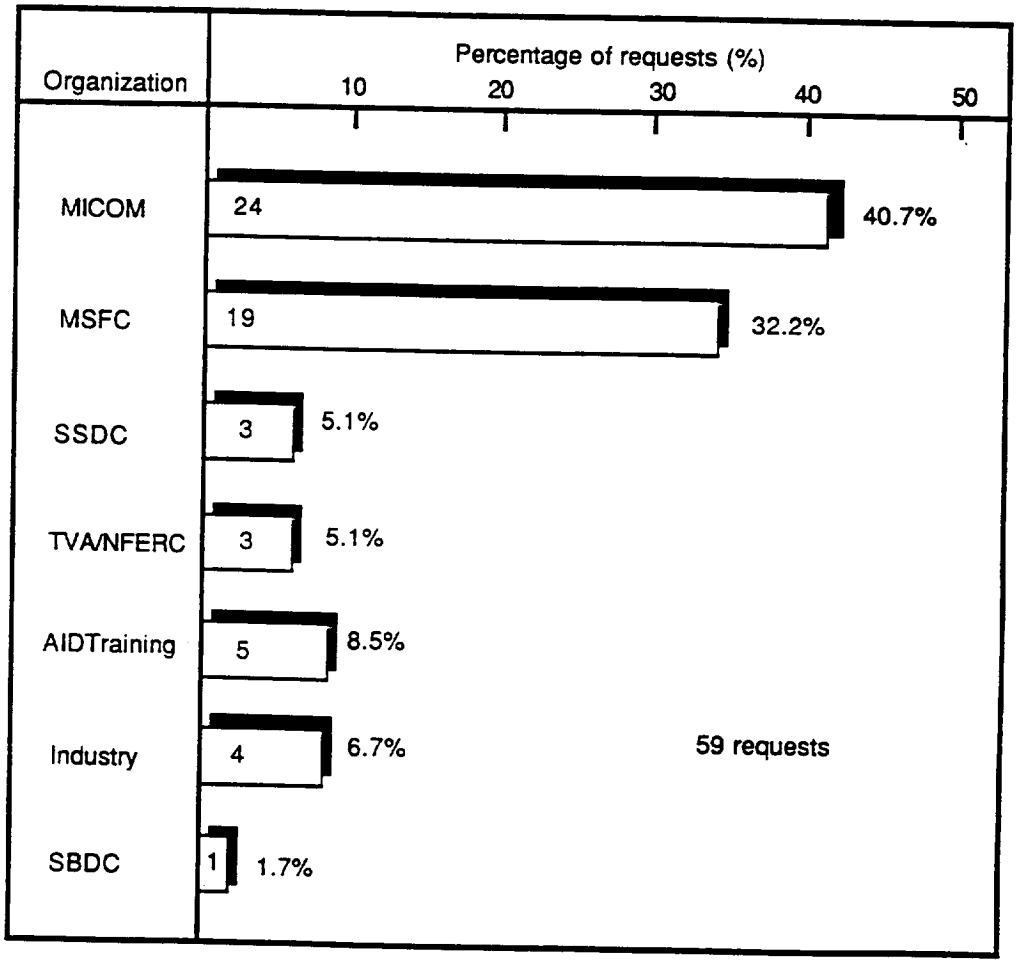


Figure 8. Organizations Responding to Requests

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.

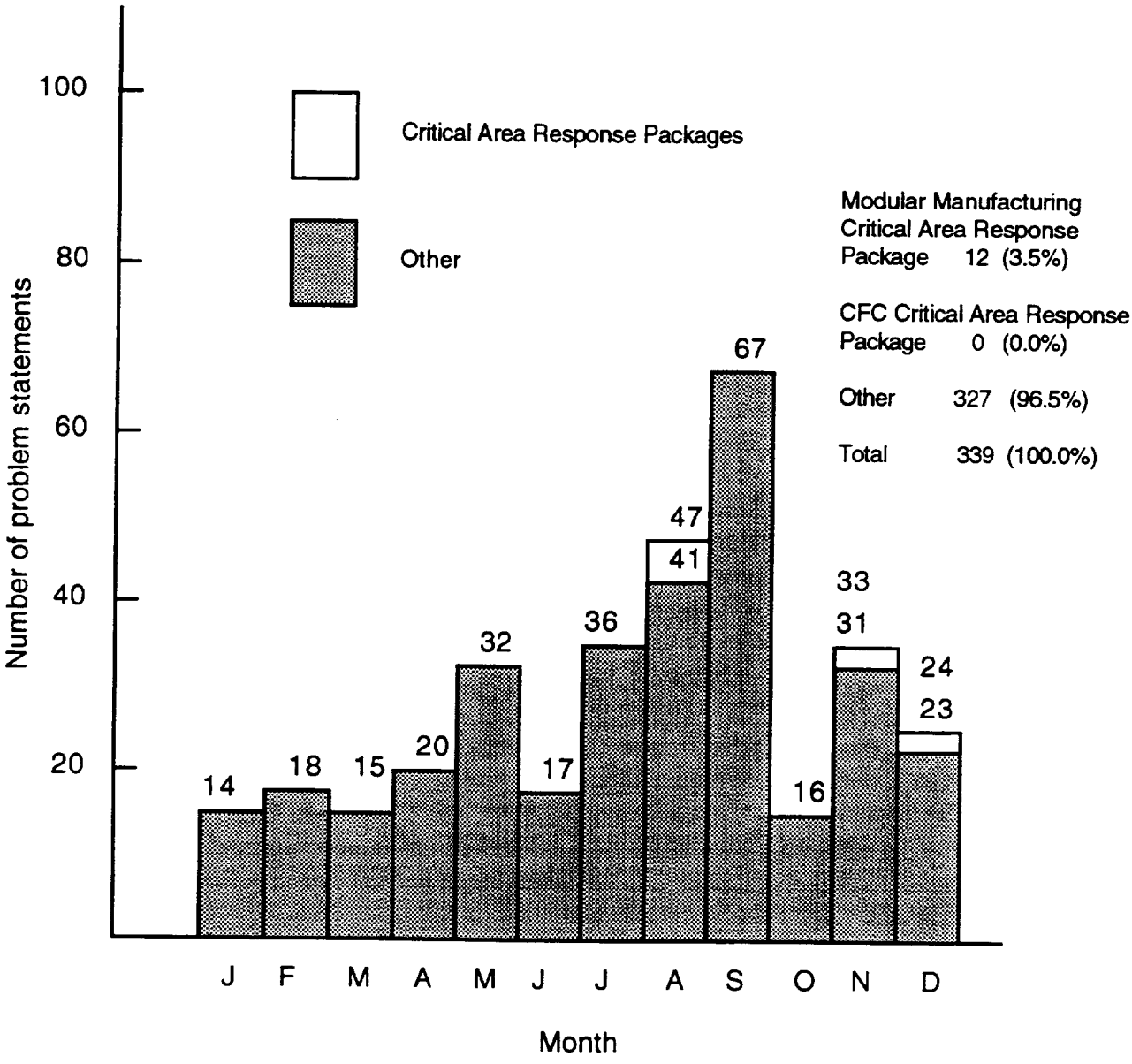


Figure 9. Problem Statements Submitted to MSFC During 1992

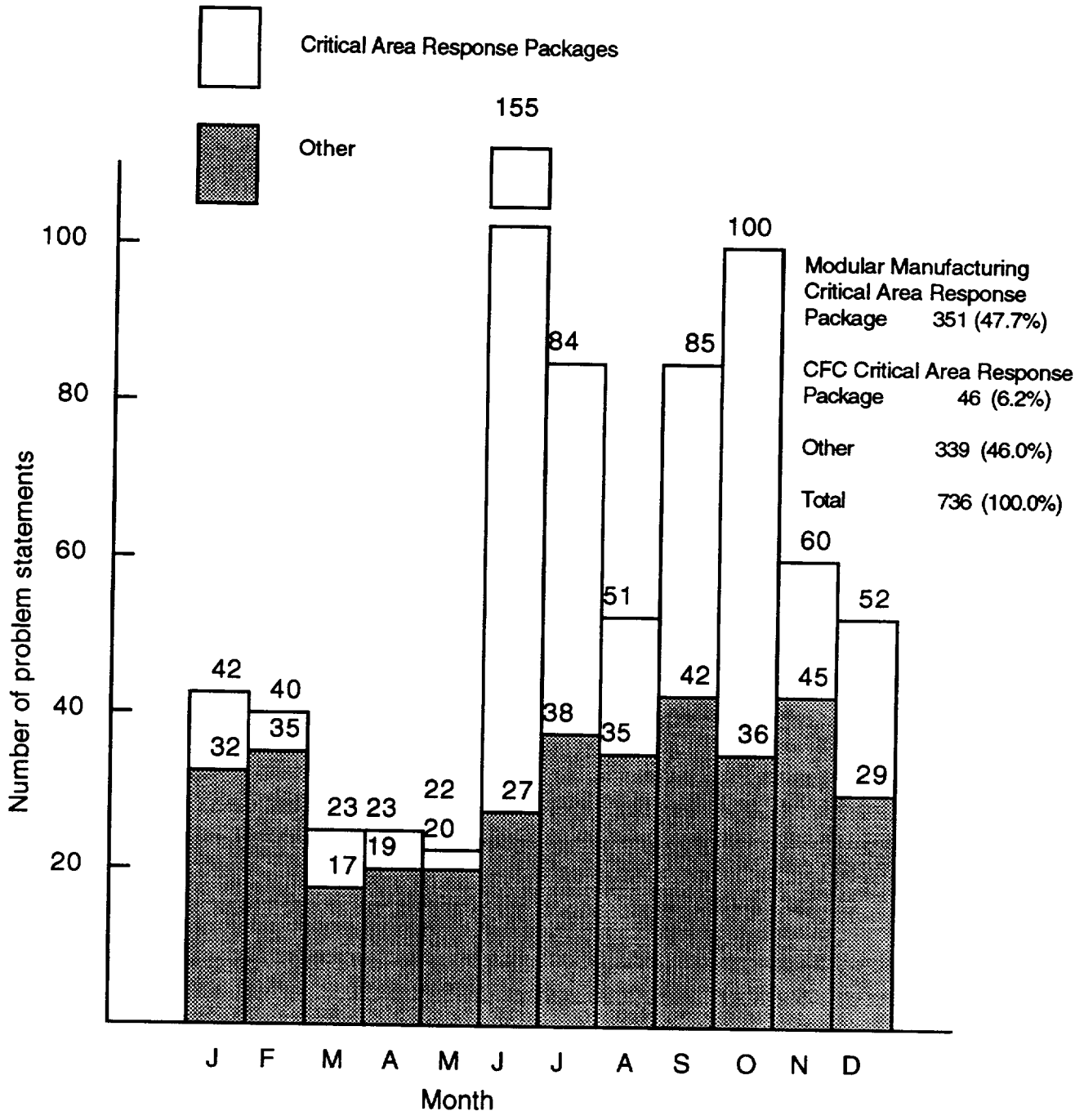


Figure 10. Problem Statements Submitted to MSFC During 1993

Table II. 1993 Problem Statements by State

State	Modular Manufacturing CAR	CFC CAR	Other Problem Statements	Total
AL	76	5	118 (34.8%)	199
GA	35	17	24 (7.1%)	76
LA	3	0	10 (2.9%)	13
MS	15	4	14 (4.1%)	33
TN	14	0	29 (8.6%)	43
WV	1	0	23 (6.8%)	24
Total	144	26	218 (64.3%)	388
Other	207	20	121 (35.7%)	348
Grand total	351	46	339 (100.0%)	736

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%)

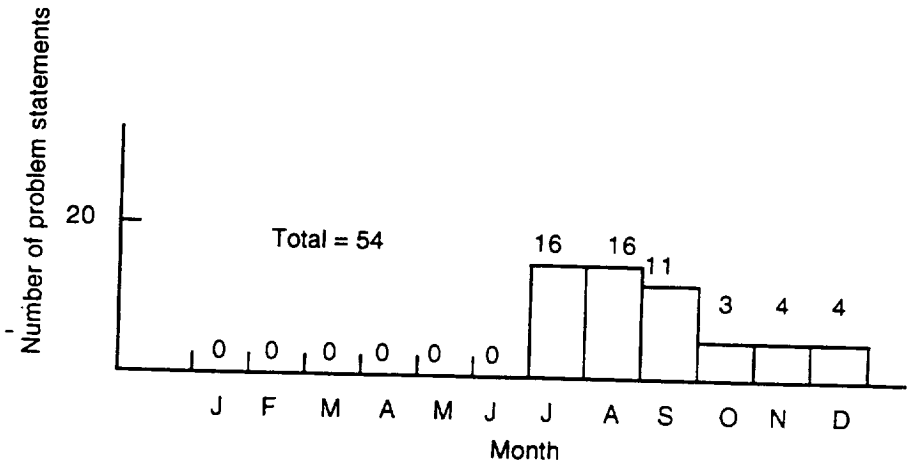


Figure 11. Problem Statements Assigned to UAH During 1992

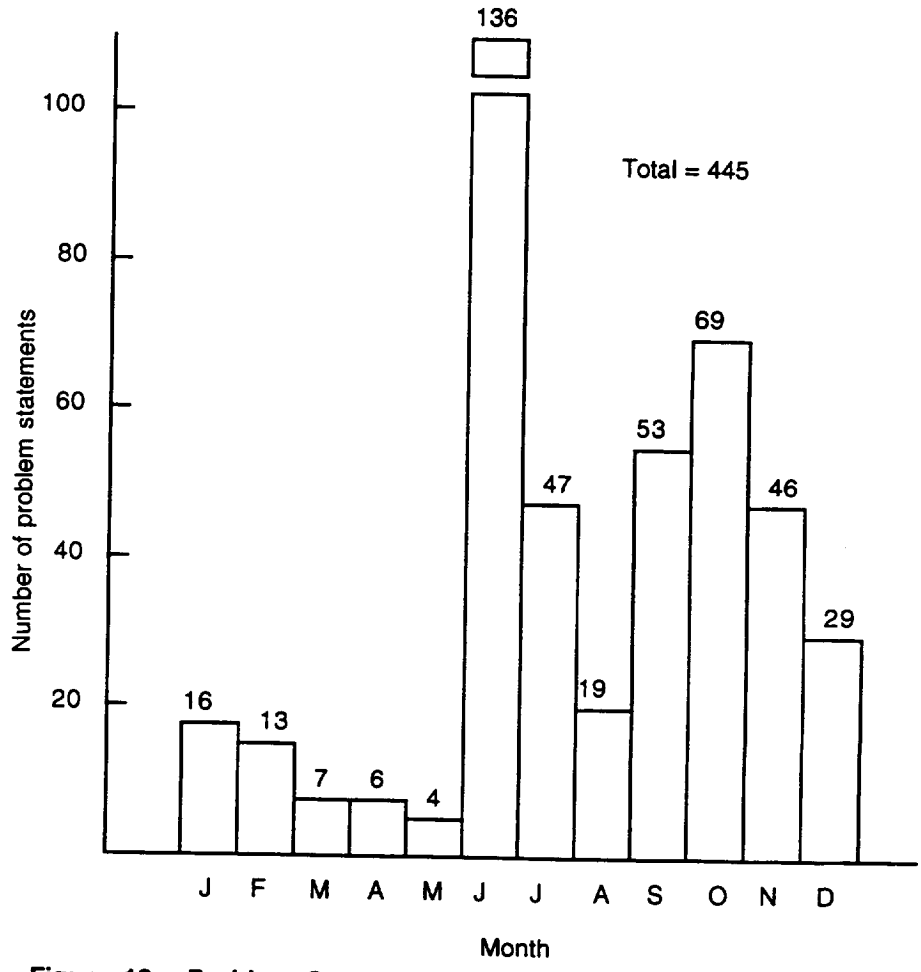


Figure 12. Problem Statements Assigned to UAH During 1993

Appendix A

Firms Requesting CFC Replacement Critical Area Response Package

Firms Requesting CFC Replacement Critical Area Response Package: (Survey January 1994)

Company	City	State	Seq. #
Campbell Engineering	Huntsville	AL	1038
Kimberly-Clark	Tucson	AZ	1193
Right Now Productions	Kensington	MD	1194
Healthtex	Greensboro	NC	1220
Bowman Computers	Grant City	MO	1221
Teledyne Brown	Huntsville	AL	1227
Allied Signal	Kansas City	MO	1236
Dow Advanced Cleaning	Richmond	VA	1273
GTRI	Augusta	GA	1274
GTRI	Albany	GA	1275
GTRI	Brunswick	GA	1276
GTRI		GA	1277
GTRI	Savannah	GA	1278
GTRI	Dublin	GA	1279
GTRI	Columbus	GA	1280
GTRI	Douglas	GA	1281
GTRI	Gainsville	GA	1282
GTRI	Macon	GA	1283
GTRI	Dublin	GA	1284
GTRI	Rome	GA	1285
ABEX/NWL Aerospace	Dublin	GA	1288
USAMICOM	Redstone Arsenal	AL	1291
USAMICOM	Redstone Arsenal	AL	1292
Stockham Valves & Fittings	Birmingham	AL	1306
Mississippi Community College	Booneville	MS	1308
Caterpillar Inc.	Corinth	MS	1310
D. Mansell	Booneville	MS	1311
Ringier America		MS	1313
Southeast Manufacturing Co.	Dublin	GA	1330
Chamber of Commerce	Douglas	GA	1331
Verlyn Enterprises	Douglas	GA	1332
DEC Corporation	Shrewsbury	MA	1353
Continental Disc Corporation		KS	1354
Northwest Manufacturing	Redmond	WA	1355
Xomox Corporation	Cincinnati	OH	1356
Allied Signal	Eatontown	NJ	1357
Parker Hannifin	St. Marys	OH	1358
Hi-Tek Manufactuing	Mason	OH	1359
New Pig Corporation	Tipton	PA	1360
Delaware Tool & Machine	Yeadon	PA	1361
Repair Dev Ctr	Cincinnati	OH	1362
Permclip Products	Buffalo	NY	1363
Detrex Corporation	Redford	MI	1364
Mercer Engineering Res Ctr	W. Robins	GA	1365
Oakite Products	Berkeley Heights	NJ	1366
Torwico Electronics	Lakewood	NJ	1367
Motor Machine Co.	Edison	NJ	1368
Caterpillar	Corinth	MS	1370
Caterpillar	E. Peoria	IL	1371
Caterpillar	Joliet	IL	1372
Spang & Co.	Butler	PA	1373
Mass Steel Treating	Worcester	MA	1374
RMS	Minneapolis	MN	1375
American Technical Ceramics		NY	1376
Des & Fab Co	Huntsville	AL	1377
Nav Sur Warfare Ctr	Indian Hd	MD	1378
Fisher Rosemount Sys	Austin	TX	1379
Hubbard-Hall	Inman	SC	1380
US EPA	New York	NY	1381
Manor Research	Hayward	CA	1382
Fast Wheels	Tulsa	OK	1383
Linvatec	Largo	FL	1384
SSP Fittings	Twinsburg	OH	1385
Hyperfine	Boulder	CO	1386
O.C. Tanner Co.	Salt Lake City	UT	1387
Turbinie Component	Tallahassee	FL	1388
Engrs & Fabricators	Houston	TX	1389
MARS Co.	Bloomington	MN	1390
Diamond Black Technologies	Conover	NC	1391

Appendix B

Firms Requesting Modular Manufacturing and Simulation Critical Area Response Package

Simulation Software Requests—State by State

COMPANY NAME	CONTACT NAME	ADDRESS	CITY	ST	ZIP	PHONE	FAX	PS #
Vanity Fair	Mr. Jim Tatum	624 S. Alabama Avenue	Monroeville	AL	36462	205/575-3231	205/743-7554	# 421
Andover Togs	Mr. Billy Anderson	201 French Drive	Scottsboro	AL	35768	205/259-3000	205/259-3165	# 463
Kappler USA	Mr. Gary Mitchell	P.O. Box 218/5000 Grimes Drive	Guntersville	AL	35976	205/582-2410	205/582-2706	# 471
Abanda Inc.	Mr. Greg Harris	1508 W. Moulton	Decatur	AL	35602	201/355-1727	205/355-6751	# 487
Brewton Fashions	Mr. Wayon J. Peevy	111 East Rankin Street	Brewton	AL	36426	205/867-7781	205/867-6952	# 495
Pridecraft Enterprises	Ms. Toni Kaminski	P.O. Box 630	Enterprise	AL	36331	205/393-1340	205/393-3187	# 596
Simplex Industries	Mr. Roger Digmon	608 Tallahatta Road	Thomasville	AL	36784	205/636-5446	205/636-4058	# 608
Lee Company	Mr. John Rouss	P.O. Box 786	Bayou LaBatre	AL	36509	205/824-4168	205/824-2718	# 641
Jacquard Lace	Lisa Butler/Chris Segars	2845 Wall Triana Hwy/P.O. Box 6029	Huntsville	AL	35824	205/772-3097	205/772-7021	# 705
Lee Company	Mr. Scott C. Burke	P.O. Box 1058/Old Moulton Hwy.	Russellville	AL	35653	205/332-4172	205/332-4295	# 709
Auburn University	Dr. Lenda Jo Anderson	264 Spindle Hall	Auburn	AL	36849	*	*	# 714
University of Alabama	Ms. Lydia Roper, Ph.D.	Box 870158	Tuscaloosa	AL	35487	205/348-8141	205/348-3789	# 741
Auburn University	Mr. J. T. Black	307 Dunstan Hall	Auburn	AL	36849	205/844-1375	205/844-1381	# 755
Lifeguard, Inc.	Mr. Mel North	18 Grimes Drive	Guntersville	AL	35976	*	*	# 803
CMC Apparel	Mr. Jeff Cowart	P.O. Box 269	Evergreen	AL	36401	205/578-1113	205/578-1171	# 829
Arrow Company	Mr. Bill Denkins	5000 Hwy 431	Guntersville	AL	35950	*	*	# 837
Oneita Industries	Mr. Terry B. Sims	P.O. Box 867	Cullman	AL	35056	205/734-0117	205/734-0014	# 857
Al. Institute for Deaf & Blind	Mr. Bill Haynes	P.O. Box 698/205 E. South Street	Talladega	AL	35160	205/761-3510	*	# 886
Advanced Composite Tech.	Mr. John A. Pavlick	P.O. Box 3038	Huntsville	AL	35810	205/859-6897	205/852-2282	# 897
Liberty Trouser Company	Mr. Clark Williams	803 South Noble Street	Anniston	AL	36201	205/466-7191	205/466-7326	# 935
Andover Togs	Mr. Leland Nall	P.O. Box 279	Pisgah	AL	35765	205/451-7411	*	# 942
Vanity Fair	Mr. Dan Forehand	624 South Alabama Avenue	Monroeville	AL	36462	205/575-7005	*	# 952
Burton Golf Bags	Mr. James Cannon	2700 25th Avenue, SE	Jasper	AL	35501	205/221-3630	*	# 966
RELTOC Mfg. Co., Inc.	Mr. Jim Whitaker	Industrial Park	Florence	AL	35630	205/764-8030	*	# 969
MSI	Mr. Patrick W. Carey	P.O. Box 4575	Huntsville	AL	35815	205/650-5646	205/882-1859	#1024
Chalk Line	Mr. Howard Wilemon	P.O. Box 38	Anniston	AL	36202	205/238-1540	205/237-9025	#1065
Auburn University	Lenda Jo Anderson	308 Spindle Hall	Auburn	AL	36849	205/844-4084	205/844-1340	#1113
G-Tees, Inc.	Mr. Ramesh Bhalerao	10990 Al. Hwy 157	Cullman	AL	35057	205/734-1324	205/737-3342	#1162
Camptown Togs, Inc.	Mr. Austin Brewer	P.O. Box 1950	Clanton	AL	35045	205/755-0540	205/755-5519	#1167
Millry Mfg. Co., Inc.	Mr. Bonts Misrok	P.O. Box 84/102 East Fifth Street	Millry	AL	36558	205/846-2915	205/846-3665	#1170
K.D. Industries	Mr. Allen Neel	P.O. Box 539/69630 Main Street	Blountsville	AL	35031			#1171
Kaye Sportswear	Mr. Michael Kaye	19635 Sandlin Road	Elkmont	AL	35620	205/732-4234	205/732-4236	#1172
Choctow Mfg. Co., Inc.	Ms. Janice Williams	P.O. Box 125-Hwy. 17 N	Silas	AL	36919	205/542-9221	205/542-9735	#1173
Gurney Apparel Division	Ms. Dorothy Turnbow	1030 N. Chestnut Street	Prattville	AL	63067	205/365-4475	205/365-1943	#1177
Vanity Fair Mills, Inc.	Mr. John C. Manning	P.O. Box 3000	Monroeville	AL	36462	205/575-2688		#1191
Crowntuft-Division of Kellwood	Mr. William Wilkinson	1015 Ross Street	Heflin	AL	36264	205/463-2231	205/463-2425	#1199
Vanity Fair Mills, Inc.	Mr. Dan Wilde	624 S. Alabama Avenue	Monroeville	AL	36460	205/575-3231		#1200
General Manufacturing	Mr. Lomax Marsh	112 Adams Road	Opp	AL	36467	205/493-9726	205/493-7427	#1201
Tee-Jays Mfg., Inc.	Mr. T.J. Jones	4129 Helton Drive/P.O. Box 2033	Florence	AL	35630	205/767-0560	205/760-1093	#1202
Valtex, Inc.	Mr. Paul R. Kunitz	205 East Avenue	Scottsboro	AL	35768	205/259-2599	205/259-2409	#1211
Kleinert's Inc. of Alabama	Mr. VAn J. McLace	2251 Old Curtis Road	Elba	AL	36323	205/897-5764	205/897-3747	#1226
TBE	Mr. Roland Woodard	P.O. Box 070007	Huntsville	AL	35807	205/726-1260	205/726-2695	#1227
Manner Corporation	Ms. Julia Dover	P.O. Box 669 (111 S. Hoyle Street)	Bay Minette	AL	36507	205/937-6767	205/937-2592	#1229
USAMICOM	Mr. John E. Howard	AMSMI-LE-SO/Redstone Arsenal	Redstone Arsnl	AL	35898			#1291
USAMICOM	Ms. Julie Creasy	AMSMI-RD-PC-JA/Redstone Arsenal	Redstone Arsnl	AL	35898			#1292
Arrow Company	Riley Lawson	5000 Hwy 431	Albertville	AL	35950			#1293
University of Alabama	Dr. Lydia L. Roper	307 Doster/P.O. Box 870158	Tuscaloosa	AL	35487	205/348-6176	205/348-3789	#1295

Fieldcrest Cannon, Inc.	Ms. Kaye Clements	I.E. Dept./P.O. Box 610	Scottsboro	AL	35768			#1301
Stockham Valves and Fittings	Mr. Brian Allardice	P.O. Box 10326	Birmingham	AL	35202	205/592-6361	205/591-1300	#1306
Pridecraft Enterprises	Mr. Rodger Harris	P.O. Box 930	Enterprise	AL	36331	205/393-1340	205/393-3187	#1317
Mar-Bax Shirt Company	Mr. Jim Lane	P.O. Box 69	Gassville	AR	72635	*	*	# 494
School Apparel, Inc.	Mr. Orin Gulseth	Jefferson & Bradley Streets	Star City	AR	71667	501/628-4232	501/628-3211	# 808
Levi's Strauss & Co.	Mr. Andy English	P.O. Box 879	Harrison	AR	72602	501/741-3471	*	# 830
Hill Co. Manufacturers, Inc.	Mr. Brian Green	45 South 4th Street	Fort Smith	AR	72901	*	*	# 908
Eudora Garment	Mr. Freddie Stanley	Hwy 65 South	Eudora	AR	71640	501/355-8381	501/355-2676	# 924
Avent, Inc. (Kimberly-Clark Co.)	Mr. James E. McGowen	3701 E. Columbia Street	Tucson	AZ	85714	602/748-6912	602/748-6949	#1193
Cali-Fame of Los Angelos	Mr. M. Kennedy	2800 E. 11th Street	Los Angelos	CA	90023	213/268-3187	213/269-7969	# 859
Alfred Paquette Mfg.	Mr. Bill Scott	1201 Rio Vista Avenue	Los Angeles	CA	90022	213/266-4561	213/264-6532	# 895
INFAB Corporation	Mr. L. S. Cusick	3651 Via Pescador	Camarillo	CA	93012	805/987-5255	805/482-8424	# 918
USA/Fashion Magic	Mr. Michael Wilcox	1307 East Pine Street	Lodi	CA	95240	209/334-1460	209/334-0403	# 962
Valentec Wells	Ms. Sandy Epperson	3190 Pullman Street	Costa Mesa	CA	92626	714/662-2163	714/540-5432	# 970
Frank Stubbs Co., Inc.	Mr. Val Taylor	4518 Vanowen Street	Burbank	CA	91505	818/842-5137	818/842-1927	#1045
Workrite Uniform	Mr. Ken Wenzel	500 East Third Street	Oxnard	CA	93001	805/483-0179	805/483-0678	#1186
Samsonite Corporation	Mr. Bruce Huang	11200 East 45th Avenue	Denver	CO	80239	303/373-7509	303/373-7343	
Speer Cusion Company	Ms. Debbie Dusinb	421 S. Interocean	Holyole	CO	80734	303/854-2911	*	# 983
Samsonite Corporation	Mr. Tony Yakish	11200 East 45th Avenue	Denver	CO	80239	303/373-7340	303/373-7343	#1187
Samsonite Corporation	Mr. William Tarczon	11200 East 45th Avenue	Denver	CO	80239	303/373-7178	303/373-7343	#1188
Apparel Mfg. Corp.	Mr. Ron Levine	29 Industrial Park Rd./P.O. Box 216	Stirling	CT	06377	*	*	# 806
SMS Textile Mills Inc.	Mr. F. Patrick Flynn	132 Franklin Street	Norwich	CT	06360	203/886-1459	203/889-3532	# 862
Apparel Programs, Inc	Mr. George Nova	7 Mt. Laurel Drive	Greenwich	CT	06831	203/629-8317	203/629-8319	# 869
Starter Corporation	Mr. Gary S. Letendre	370 James Street	New Haven	CT	06513	203/781-4000	203/773-3411	# 941
R.J. Bell Associates	Mr. Richard J. Bell	P.O. Box 1924	Manchester	CT	06040	203/646-3282	Have no FAX	# 979
US Int'l Trade Commission	Mr. Olha Holoyda	500 E. Street/413 E	Washington	DC	20436	*	*	# 809
Lake Butler Apparel Co.	Mr. Joe Stephenson	P.O. Box 688/650 2nd Street	Lake Butler	FL	32054	904/496-3601	904/496-2404	# 648
Starke Uniform Mfg. Co.	Mr. Glen Kuhn	P.O. Box 1150	Starke	FL	32091	904/964-5090		# 798
FLA Orthopedics	Mr. Jorge J. Solis	13050 NW 47th Avenue	Opa Locka	FL	33054	305/820-1900	305/688-4951	# 816
Superior Surgical Mfg. Co.	Mr. Mark Decker	10099 Seminole Boulevard	Seminole	FL	34642	813/397-9611	813/391-5401	# 877
SPI Corporation	Mr. T. Taylor	7501 W. 18 Lane	Hialeah	FL	33014	305/826-8568	305/826-8604	# 933
L & M Fashions	Mr. David Behar	940 West 19th Street	Hialeah	FL	33010	305/883-0681	305/883-7505	# 953
Charles Gilbert Associates	Mr. Bob Lowder	P.O. Box 70427	Marietta	GA	30007	404/642-1704		# 564
GTRI	Mr. John Adams	209 O'Keefe Building	Atlanta	GA	30332	*	*	# 651
Southern Tech/App & Textile	Professor Larry Haddock	1100 South Marietta Parkway	Marietta	GA	30060	404/528-7273	404/528-7454	# 698
Refrigiwear	Ms. Christa DeVine	Route 6/Box 443	Dahlonega	GA	30533	404/864-6757	404/864-5898	# 724
LaMar Manufacturing	Mr. Scott L. Wise	152 City Hall Avenue	Bowden	GA	30108	404/258-7201	404/258-7098	# 768
Lectra Systems	V. Sisk	844 Livingston Court	Marietta	GA	30067	404/422-8050	404/422-1503	# 784
Riverside Manufacturing	S. Wise	P.O. Box 460	Moulirie	GA	31776	*	404/258-7098	# 785
Applied Mgmt. Sciences	Mr. Jose J. Berrios	11180 Amy Frances Lane	Alpharetta	GA	30202	404/664-4326		# 821
Kuppenheimer Men's Clothes	Mr. Al Gonsalves	4601 Highway 78	Loganville	GA	30249	404/466-4851	404/466-6655	# 852
Kurt Salmon Associates	Mr. Dave Rush	1355 Peachtree St./Suite 900	Atlanta	GA	30309	*	404/898-9590	# 867
Coordinated Apparel Group	Mr. Jeff McLain	415 East Oak Street	McRae	GA	31055	912/868-6444	912/868-2190	# 868
Oxford Industries Inc.	Mr. John Brewton	Box 408	Vidalia	GA	30474	*	*	# 881
Freitex, Inc.	Mr. Michael Fiorilla	1300 West Oakridge Drive	Albany	GA	31708	912/436-7266	912/436-7268	# 887
Riverside Mfg. Company	Mr. Mike Folsom	P.O. Box 460	Moultrie	GA	31776	912/985-5210	912/985-5210	# 900
Champion Products Inc.	Mr. Morris Taylor	US 129 South/P.O. Drawer 99	Fitzgerald	GA	31750	912/423-6551	*	# 904
The William Carter Company	Mr. Fernando Angulo	P.O. Box 937	Griffin	GA	30224	404/228-0930	*	# 905
Riverside Mfg. Company	Mr. David Wheaton	6105 Xavier Drive SW	Atlanta	GA	30336	404/346-7400	404/344-0653	# 916
None given	Mr. Jim H. Davis	49 Lakeshore Drive	Duluth	GA	30136	404/242-7106	*	# 934
Elberton Mfg. Company	Mr. John Huffman	P.O. Box 870	Elberton	GA	30035	706/283-2751	706/283-9817	# 936
Platex Apparel	Mr. Ruben Ortiz	P.O. Box 429	Carrolton	GA	30264	*	*	# 964
Playtex Apparel Inc.	Mr. Hector Cabildo	Carrolton Hwy./P.O. Box 429	Newnan	GA	30264	404/253-2121	404/304-8717	# 974
Apparel Industry International	Mr. M. Cortazar	6255 Barfield Road, Suite 200	Atlanta	GA	30328	404/252-8831	404/252-4436	#1017

Yonah Packaging Company	Mr. Toby Bruce	P.O. Box 280	Cornelia	GA	30531	706/778-2126	706/776-2218	#1037
Fieldcrest Cannon, Inc.	Mr. Mike Sinquefield	1412 Front Avenue	Columbus	GA	31901	*	*	#1041
Leadtec Systems	Ms. Ann Holt	3900 Green Industrial Way	Atlanta	GA	30341	404/455-0664	800/882-3679	#1095
Kurt Salmon Associates, Inc.	Ms. Helena Johnson	1355 Peachtree Street NE	Atlanta	GA	30309		404/898-9590	#1111
Durkopp Adler America, Inc.	Mr. Guillermo Hernandez	3025 Northwoods Parkway	Norcross	GA	30071	404/448-8162	404/448-1545	#1158
American Apparel Contractors	Ms. Sue Strickland	P.O. Box 720693	Atlanta	GA	30358	404/842-3171	404/256-5380	#1174
Arrow Company	Mr. Dennis Heller	4150 Boulder Ridge Drive	Atlanta	GA	30336	404/346-5365	404/346-5300	#1181
Stikits, Inc.	Mr. David Harris 3100	Medlock Bridge Rd/Suite 120/Blg 200	Norfolk	GA	30071	404/662-0538	404/662-0538	#1203
Woolrich, Inc.	Mr. Charles Aides	P.O. Box 99/Railroad Street	Ailey	GA	30358	912/583-2231		#1204
GTRI Regional Office	Mr. Sherman L. Dudley	P.O. Box 1244/405 N. Peterson Ave.	Douglas	GA	31533	912/384-1121	912/384-4151	#1281
GTRI Regional Office	Mr. George H. Lee	P.O. Box 5105/990-B Riverside Drive	Macon	GA	31201	912/751-6190		#1283
GTRI Regional Office	Mr. Robert Springfield	1 Reservation Street	Rome	GA	30161	706/295-6008		#1285
ABEX/NWL Aerospace	Mr. Darrell Freeman	2010 Academy Avenue	Dublin	GA	31021	912/277-9207	912/277-9228	#1288
Thomson Company	Mr. Wayne Cooperman	P.O. Box 720/643 O'Neal Street	Thomson	GA	30824	706/595-2434	706/595-8102	#1286
Oxford Shirtings	Mr. Keith Spivey	901 North Street West/P.O. Box 408	Vidalia	GA	30474			#1302
Toombs County Mfg. Co.	Mr. Ronnie Tyson	P.O. Box 657/Hwy 292 West	Lyons	GA	30436	912/526-8101	912/526-8964	#1303
Augusta Bag Company	Mr. Hugh hamilton	P.O. Box 335	Evans	GA	30809			#1337
Pomaré Ltd.	Mr. Jack Cotner	700 N. Nimitz Hwy.	Honolulu	HI	96817	808/524-3966	808/533-6809	# 943
Aalfs	Mr. John P. Dieltz	P.O. Box 3567	Sioux City	IA	51102	712/252-1877	712/252-5205	# 593
PELLA Products	Mr. Barry E. Moore	P.O. Box 508	New Sharon	IA	50207	515/637-2582		# 802
K-Products	Mr. Scott Ray	1520 Albany Place SE	Orange City	IA	51041	*	*	# 836
Pella Products	Mr. David Kurimski	Hwy. 63 South/P.O. Box 508	New Sharon	IA	50207	515/637-2585	*	#1004
Iowa State University	Ms. Grace I. Kunz	1071A LeBaron/Textiles & Clothing	Ames	IA	50011		515/294-6364	#1207
#1 Apparel	Mr. Troy Graham	Industrial Air Park, P.O. Box #1	Orange City	IA	51041	800/369-2333	712/737-2882	#1300
Fashionaire Apparel, Inc.	Mr. Brent Murphy	363 Commercial Street	Marseilles	IL	61341	815/795-6233	815/795-6233	# 795
Wells Lamont	Mr. Homer L. Jenkins	6640 West Touhy Avenue	Niles	IL	60714	708/647-4587	708/647-6943	# 981
Eaton Corporation	Mr. Monte Schroer	191 East Norh Avenue	Carol Stream	IL	60188	708/260-3400		#1206
Jay Garment Company	Mr. Harry Scott	P.O. Box 907	Portland	IN	47371	*	*	# 810
Quest Apparel Ltd.	Mr. Joe H. Cook	350 W. First Street	Calhoun	KY	42327	502/273-3172	502/322-8179	# 604
OshKosh B'Gosh	Ms. Debbie Brown	Albany Div./800 Nunn Street	Albany	KY	42602	606/387-8811	606/387-7872	# 736
BILAL	Mr. Joe McNealy	2317 West Chestnut Street	Louisville	KY	40211	502/582-1699	502/778-4523	# 813
Kendall-Futuro	Mr. Stewert M. Witt	1 Riverfront Place	Newport	KY	41071	513/576-8000	513/576-8272	# 817
Fruit of the Loom	Mr. Brad Clark	P.O. Box 90015	Bowling Green	KY	42102	*	*	# 932
Kentucky Textiles, Inc.	Ms. Cheryl Sanders	One Twentieth Street	Paris	KY	40361	606/987-5229	606/987-1871	# 996
Corbin Limited	Mr. Tim Molton	P.O. Box 7000 / 151 West Lynn Ave.	Ashland	KY	41105	606/928-3333	800/950-0003	#1084
Smart Quality Manufacturing	Mr. Bob Lobos	1400 W. Maple Avenue	Eunice	LA	70535	318/457-2075	318/457-2085	# 814
Martin Mills Inc.	Mr. Chris Frey	6261 Main Hwy/P.O. Box 129	St. Martinville	LA	70582	318/394-6041	318/394-9919	# 823
Lynley designs, Inc.	Mr. Bruce Jackson	824 Dakin Avenue	Jefferson	LA	70121	504/833-7667	*	# 892
WEMCO Inc.	Mr. Larry Leopold	966 S. White Street	New Orleans	LA	70125	504/822-3700	504/821-1088	# 982
Cam Co. c/o Blauer Mfg. Co.	Mr. Michael Blauer	20 Aberdeen Street	Boston	MA	02215	617/536-6606	617/536-6948	# 489
Grieco Brothers, Inc.	Mr. Joe Blair	50 Island Street	Lawrence	MA	01840	508/686-3833	508/686-9802	# 873
Charles Stark Draper Lab. Inc.	Mr. James Mueller	555 Technology Square	Cambridge	MA	02139	617/258-1000	617/258-3153	# 888
Stride Rite Corporation	Mr. Roger W. Monks	5 Cambridge Center	Cambridge	MA	02142	617/499-6204	617-491-8298	#1192
Yale Sportswear	Mr. Frank Drumheller	215 North Washington Street	Easton	MD	21601	*	*	# 872
Right Now Productions	Mr. David Elinan	10531 Summit Avenue	Kensington	MD	20895	301/493-6423		#1194
London Fog Industries, Inc.	Ms. Patricia A. Renfrew	3 Orchard Drive	Boonsboro	MD	21713	301/432-5181		#1299
Chrysler Corporation	Mr. Dennis J. Fobar	12000 Chrysler Dr./CIMS 417-15-05	Highland Park	MI	48288	*	*	# 839
IFG Engineering	Mr. John Siddall	2150 Alpine Avenue	Grand Rapids	MI	49504	616/246-3560	616/246-3600	# 845
Johnson Controls, Inc.	Mr. Terry L. Cornelius	49200 Halyard Dr./P.O. Box 8010	Plymouth	MI	48170	*	*	#1006
Stearns Manufacturing Co.	Mr. Gary J. Kittleson	P.O. Box 1498	St. Cloud	MN	56302	612/252-1642	612/252-4425	# 655
Lees Mfg. Co./Kid Duds	Mr. Tom Paulson	500 W. Washington	Cannon Falls	MN	55009	507/263-3941	507/263-4600	# 850
Lee Company	Mr. Michael Pickron	1900 Industrial Drive	Lebanon	MO	65536	*	*	# 521
American Athletic Apparel	Ms. Donna Riley	240 East Owen	Puxico	MO	63960	314/222-3079	314/222-3007	# 685
Cloverleaf Mfg. Company	Mr. Brad Johnson	302 Railroad Avenue	Appleton City	MO	64724	816/476-2548	816/476-2136	# 820

Columbia Sportswear Co.	Mr. Lee Horton	Chaffee Industrial Park Hwy	Chaffee	MO	63740	314/887-3681	314/887-6268	# 822
Biltwell Clothing Company	Ms. Martha Boren	1st and A Streets	Farmington	MO	63640	314/756-6613	314/756-7471	# 827
Uniland	Mr. Gary Carter	7002 King Hill Avenue	St. Joseph	MO	64504	816/238-8504	816/238-7707	# 863
National Garment Company	Mr. Larry Martin	514 Earth City Expressway/Suite 312	St. James	MO	63045	*	*	# 957
Hagale Industries	Mr. Paul Stickley	6th & Waverly	Ozark	MO	65721	*	417/485-2351	# 980
Sportswear Mfg.	Mr. Dan Mannion	224 North Washington Street	Neosho	MO	64850	417/451-6451	417/451-9444	#1005
Paramount Headwear	Mr. Fred Mussig	1 Paramount Drive	Bourbon	MO	65411	314/732-4411	314/732-5211	#1178
Elder Manufacturing Co., Inc.	Mr. Gregory Beile	12747 Olive Street/Suite 300	St. Louis	MO	63141	314/469-1120		#1327
American Trouser Inc.	Mr. John Greer	P.O. Box 391	Columbus	MS	39703	601/329-8175	601/329-8110	# 644
Stuffed Shirt	Mr. Sam McClinton	P.O. Box 340	Pass Christian	MS	39571	601/452-4666	601/452-9046	# 646
Maybelle Manufacturing Co.	Mr. Leonard J. Papania	2604 24th Avenue	Gulfport	MS	39501	601/864-4971		# 663
Stevens Sportswear Co., Inc	Mr. Ed Kennedy	P.O. Box 557	Taylorsville	MS	39168	601/785-6533	601/785-4944	# 793
Action Industries, Inc.	Mr. Mark W. Clayton	P.O. Box 1627	Tupelo	MS	38802	601/566-7211	601/566-3386	# 826
Carthage Company	Mr. Charles E. Boutwell	511 East Franklin Street	Carthage	MS	39051	601/267-9672	601/267-3938	# 871
Nazareth/Century Mills, Inc.	Mr. Pedro R. Felix	114 County Road 684	Quitman	MS	39355	601/776-6945	601/776-4067	# 965
None given	Mr. Fred Henderson	509 W. Tate Street	Senatobola	MS	*	*	No FAX	# 987
Amory Garment Company	Mr. Robert Howard	South Main & Third Street	Amory	MS	38821	601/256-2606	601/256-2673	#1053
Nemanco, Inc.	Mr. Doyle Agent	P.O. Box 268 / Hopewell Road	Philadelphia	MS	39350	601/656-7361	601/656-7645	#1169
Bernstein & Sons Shirt Corp.	Mr. Mike Pliaconis	P.O. Box 111 / Railroad Avenue	Crystal Springs	MS	39059	205/892-4551		#1175
Kellwood Company	Mr. Luther Reece	P.O. Box 950/529 S. Broadway	McComb	MS	39648	601/276-4320	601/249-3220	#1185
NE Miss. Community College	Mr. Billy Boldin	Cunningham Boulevard	Booneville	MS	38829	601/728-7751	601/728-1165	#1309
Prentiss County Dvlpmnt Assoc	Mr. Doug Mansell	P.O. Box 672	Booneville	MS	38829	601/728-3505		#1312
Sara Lee Knit Products	Mr. Donald L. Milligan	P.O. Box 3019	Winston-Salem	NC	27102	919/519-4400		# 754
Remington Apparel	Mr. Doug Krhbiel	P.O. Box 180	Welmington	NC	28402	919/763-6543		# 797
Jasper Textiles	Mr. John Graham	P.O. Box 2519	Lumberton	NC	28359	*	*	# 804
K & R Sportswear	Mr. Glen Yasser	602 West Branch Street	Spring Hope	NC	27882	*	*	# 807
Sew Special, Inc.	Mr. Andrew Bucior	2224 S. Fayetteville Street	Asheboro	NC	27203	919/625-3971	919/626-2354	# 815
Fabtex, Inc.	Mr. John Raykowski	600 Crandlemire Road	Lumberton	NC	28358	*	*	# 825
Burlington House Draperies	Mr. Dennis Clark	P.O. Box 1290	Reidsville	NC	27321		919/342-4955	# 832
None given	Mr. Jim Tatum	1421 S. Elm Street	Greensboro	NC	27420	919/373-3591	*	# 834
Royal Home Fashions Inc.	Ms. Kim Chavis	Rt. 4 Box 483-E	Henderson	NC	27536	919/492-5730	919/483-3117	# 853
Rocky Mount Undergarment	Mr. Dick Proseus	1536 Boone Street	Rocky Mount	NC	27801	919/446-6161	919/442-4412	# 861
Royal Home Fashions	Mr. Ron Boisvert	7320 Oakwood St. Ext.	Mebane	NC	27302	*	*	# 875
Burlington House Drapery	Ms. Elaine Simmons	P.O. Box 1290	Reidsville	NC	27321	919/342-3311	*	# 878
Fieldcrest Cannon, Inc.	Mr. William P. DeLapp	One Lake Drive	Kannapolis	NC	28081	*	*	# 883
Hickory Springs Mfg. Co.	Mr. Jeff Lail	P.O. Box 2948	Hickory	NC	28603	704/328-2201	*	# 890
Marithé & Francois Girbaud	Mr. Richard Brock	P.O. Box 77699	Greensboro	NC	27417	919/547-0975	*	# 903
Textile/Clothing Technology	Ms. Barbara Mazziotti	211-Gregson Drive	Cary	NC	27511	919/380-2156	919/380-2181	# 923
Snow Hill Apparel, Inc.	Mr. David Rogers	Route 2, Box 490	Snow Hill	NC	28540	919/747-8200	*	#1061
Kinston Shirt Company	Ms. Donna Smullen	501 East Caswell Street	Kinston	NC	28501	*	*	#1062
	Lawana Viers	P.O. Box 869	Chocowinity	NC	27817	919/975-1825		#1112
Hampton Industries	Jean Adams	P.O. Box 614	Kinston	NC	28502	919/527-8011		#1208
Manchester Knitted Fashions	Mr. Donald Gearty	33 south Commercial Street	Manchester	NH	03101	603/669-5370	603/669-0542	# 922
Int'l Shoe Machinery Corp.	Mr. Paul E. DuVerger	Simon & Ledge Streets	Nashua	NH	03060	*	*	# 975
Gale River	Ms. Katy Cuvnyr	P.O. Box 847	Franconia	NH	03580	603/823-5365	603/823-8002	#1056
Cachet Sports	Mr. R. Hernandez	550 Gregory Avenue	Weewhakin	NJ	07087	201/865-0466		# 652
The Lumiscope Co., Inc.	Ms. Aina Rathbun	400 Raritan Center Parkway	Edison	NJ	08837	908/225-5533	908/225-7047	# 828
Hope Uniform Co., Inc.	Mr. Fred Belverio	Columbia Street/P.O. Box 224	Columbia	NJ	07832	908/496-4900	908/496-4990	# 910
Secretly Yours, Inc.	Mr. Michael Ames	1500 Hudson Street, Bldg. 5D	Hoboken	NJ	07030	201/963-0800	201/963-1296	#1036
Maidenform	Mr. Felix Lettini, 5A	154 Avenue E	Batonne	NJ	07002	201/436-9200	201/436-9506	#1114
Para-Flite Incorporated	Mr. William F. Bruno	5800 Magnolia Avenue	Pennsauken	NJ	80109	609/663-1275	609/663-3028	#1225
Glamorise Foundation	Mr. John Pundyk	135 Madarion Street	New York	NY	10016	*	*	# 811
Voyager Emblems, Inc.	Mr. David S. Grant	3703 Lockport Road	Sanborn	NY	14132	800/828-1603	716/731-4365	# 874
A. H. Schreiber Co., Inc.	Mr. Elliot N. Schreiber	460 West 34 Street	New York	NY	10001	212/564-2700	212/594-7234	# 893

New Era Cap Co., Inc.	Mr. Vince Farallo	331 Myrtle Avenue	Buffalo	NY	14212	716/852-2969	716/842-1727	# 894
Allison Fashions	No contact name given	206 Moore Street	Brooklyn	NY	11200	*	*	# 906
Mademoiselle Sweaters	Mr. Ronald Karpman	930 Flushing Avenue	Brooklyn	NY	11206	718/417-7245	718/417-8989	# 911
Christina USA, Inc.	Ms. Deborah Quijano	1411 Broadway/23rd Street	New York	NY	10018	212/391-0710	212/764-8860	# 915
Holiday Togs, Inc.	Mr. Louis Dello Iacono	141 W. 36th Street	New York	NY	10018	212/714-0467	*	# 925
Play Knits Inc.	Mr. Howard Bryks	240 W. 4oth Street	New York	NY	10018	*	*	# 940
Park Lane	Mr. David Strauss	109 East 38th Street	New York	NY	10016	212/679-6040	212/679-6049	# 963
Cassic Ctoillion	Mr. Ken Prizeman	112 W. 34 Street	New York	NY	10120	212/564-0111	212/465-2030	# 972
Nancy Fashions, Inc.	Mr. John Defeo	142 Union Avenue	New Rochelle	NY	10801	914/636-0094	914/636-0096	#1019
Ballin International	Mr. M. Bruno Grouix	101 West 55th Street, Suite 10A	New York	NY	10019	212/247-6297	212/247-6297	#1023
Grant Thornton	Mr. Lawrence Baye	605 Third Avenue	New York	NY	10158	212/599-0100	212/370-4520	#1333
U.S. Shoe Shop	Mr. Tom Burchard	One Eastwood Drive	Cinncinatti	OH	45227	513/527-7248		# 794
Holloway Sportswear, Inc.	Mr. Steve Jenkins	607 East Pike	Jackson Cntr.	OH	45334	513/595-6193	513/596-6283	# 800
Buckeye Apparel, Inc.	Mr. Gregory A. James	211 East Main Street	Coldwater	OH	45828	419/678-2300	419/678-3577	# 843
Wilson Sporting Goods	Mr. Mark Fisher	217 N. Liberty Street	Ada	OH	45810	419/634-4630	419/634-9901	# 866
Lion Apparel	Ms. Linda Parker	3401 Park Center Drive	Dayton	OH	45420	513/898-1949		#1179
King Louie Int.	Mr. N. Tambunman	10 North Poplin Road	Adair	OK	74330	918/785-2072	*	# 984
Bee-Wild Apparel	Mr. Mike Greenfield	9 NW 23 Street	Oklahoma City	OK	73103	405/525-6666	405/525-6686	#1180
Pendleton Woolen Mills	Mr. Mark Poulin	10505 SE 17th Avenue	Milwaukie	OR	97222	503/654-0444	503/273-2590	# 854
Nike Corporation	Mr. Dan Taylor	1 Bowerman Drive MJ3	Beaverton	OR	97005	503/671-3713	503/671-6300	# 856
Toklat	Mr. Pete Yazzolino	P.O. Box 488	Lake Oswego	OR	97034	503/636-6212	*	# 865
Nike Inc.	Mr. Lalit Monteiro	One Bowerman Drive	Beaverton	OR	97005	503/671-3265	503/671-6300	# 973
Werner Works	Mr. Steve Gern	P.O. Box 974	Roseburg	OR	97470	503/672-3213	503/673-4793	# 978
Nike, Inc.	Mr. Robert Levesque	One Bowerman Drive	Beaverton	OR	97005	*	No FAX	# 986
Pendleton Woolen Mills	Ms. Leslie S. Sutton	220 NW Broadway	Portland	OR	97209	503/226-4801	503/273-2599	#1025
Jantzen	Mr. Steve Bouher	P.O. Box 3001	Portland	OR	97208	503/238-5620	503/238-5087	#1183
Arthur Miller Association	Mr. Arthur Miller	114 Forrest Avenue/Suite No. 110	Narberth	PA	19072	*	*	# 812
Perfect Industrial Uniform	Mr. Steven Zalman	2585 Interplex Drive	Trevose	PA	19053	215/638-1330	215/638-4262	# 818
Ideal Products	Mr. Jeff Rickard	101 W. Dubois Avenue	Dubois	PA	15801	814/371-3200	814/371-7242	# 831
Woolrich Woolen Mills	Mr. Kevin Gray	Pioneer Road	Jersey Shore	PA	17740	*	*	# 838
DPSC-VDE	Mr. William Miller	2800 S. 20th Street	Philadelphia	PA	19101	215/737-5376	*	# 842
The Farel Corporation	Mr. John Varljen	300 Grant Street	South Fork	PA	15956	814/495-4625	814/495-5550	# 870
Merry Maid Incorporated	Mr. Andrew Debreceni	25 Messinger Street	Banook	PA	18013	215/588-0927	215/588-4932	# 879
Bearse Mfg. Company	Mr. Bob Powers	2022 Yorktown North	Jeffersonville	PA	19403	215/539-7079	*	# 885
Wrights Knitwear Corporation	Mr. Paul Stephenson	800 West Market Street	Auburn	PA	17922	717/754-3261	717/754-7261	# 899
Dallco Industries, Inc.	Mr. David A. Haverstock	P.O. Box 2727	York	PA	17405	717/854-7875	717/845-5283	# 926
Paris Accessories, Inc.	Ms. Susie Stafiniak	40 Third Street	Walnutport	PA	18088	215/767-3051	215/767-8221	# 961
Tritex Sportswear	Ms. Darlene Shields	N. Branch Avenue & 31st Street	Altoona	PA	16603	814/944/9476		#1094
Gilbraltar, P.R., Inc.	Mr. Solomon Ludwig	P.O. Box 949	San Lorenzo	PR	00754	809/736-6776	809/736-6777	#1026
Playtex Durado Corporation	Mr. Roy B. Fernandez	P.O. Box 548	Durado	PR	00646	809/796-1100	*	#1044
Byte Systems	Ms. Rose Winch	317 Neely Ferry Road	Mauldin	SC	29662	803/288-7206	803/288-4544	# 640
Roberts, Curry & Co.	Mr. David J. Penson	Eight Williams Street	Greenville	SC	29601	803/233-4321	803/235-4902	# 697
The Edge, Inc.	Ms. Connie Lowery	P.O. Box 1195	Camden	SC	29020	803/432-7674	803/425-5064	# 729
Milliken & Company	Mr. Skip Forbes	P.O. Box 1926 M132	Spartanberg	SC	29304	*	*	# 799
Gerber Childrenswear	Ms. Mary Ward	P.O. Box 369	Pelzer	SC	20669	803/947-3830	803/947-3835	# 882
Clemson Apparel Research	Ms. Penny Klein	500 Lebannon Road	Pendleton	SC	29670	803/646-8454	*	# 898
Diversified Systems, Inc.	Mr. Eddie Burgess	P.O. Box 31229	Greenville	SC	29608	803/271-2668	803/271-3756	# 917
Charleston Mfg. Company	Mr. Richard Drum	4285 Pace Street	Charleston	SC	29405	803/744-6271	*	# 920
Coats & Clark	Mr. Russell D. Karr	30 Patewood Drive/Suite 351	Greenville	SC	29615	803/234-0331	803/234-5568	# 956
Westpoint Pepperell	Mr. Ed Young	P.O. Box 1800/Cherry Road	Clemson	SC	29631	803/653-2835	*	# 971
Americas 21st, Inc.	Mr. Leonard J. Egan	85 Commerce Drive	Greenville	SC	29615	803/297-3733	803/297-3731	# 998
One Adobe Apparel	Mr. Lane Tarleton	902 Montague Avenue	Greenwood	SC	29649	803/223-7838	803/223-1313	#1168
SE Apparel Mfg. & Suppliers	Mr. Al Howell	1900 Broad River Road	Columbia	SC	29210	803/772-5861	803/731-7709	#1176
Joanna (div. of CHF Industries)	Mr. Zougeir Aboubarb	P.O. Box 502	Clinfon	SC	29325	803/833-3953		#1184

Highland Industries	Ms. Anne W. Baker	Cheraw Plant/650 Chesterfield Road	Cheraw	SC	29520	803/537-8241	803/537-8279	#1205
Southeast Mfg Technology Ctr	Mr. Thomas M. Mitchell	500 Lebanon Road	Pendleton	SC	29670	803/646-8454	803/646-8230	#1316
Raven Industries, Inc.	Mr. John Zumhofe	P.O. Box 5107	Sioux Falls	SD	57117	*	*	# 919
The Computer Center	Mr. Dale Sweitzer	Suite 25 Woodmere Mall	Crossville	TN	38555	615/456-7767	615/456-1418	# 647
Todd Uniform, Inc.	Mr. Rick Ring	North Industrial Park	Ripley	TN	38063	901/635-3075	901/635-1067	# 742
Fulton Apparel	Mr. Ed Fuller	109 North Ash Circle	S. Pittsburg	TN	37380	615/837-7871		# 796
American Uniform Co.	Mr. Gary Stonecipher	2180 North Parker St./P.O. Box 2130	Cleveland	TN	37311	615/559-3855	615/476-6561	# 841
Volunteer Apparel, Inc.	Mr. Vern Sipe	3311 Highway 61 East	Lutterell	TN	37779	615/992-6471	615/992-4360	# 855
Bertrand Frank Associates	Mr. Gary Shaver	229 Ward Circle, Suite A-22	Brentwood	TN	37027	615/377-9816	615/371-9742	# 858
Horace Small Apparel Co.	Ms. Buffy Briley	350 28th Avenue N.	Nashville	TN	37209	*	*	# 891
Martin Mfg.	Ms. Rosemary Marby	Box 350/Hwy 22/Public Wells Rd.	Martin	TN	38237	901/587-3861	*	# 896
Wilson sporting Goods	Ms. Mary Barry	P.O. Box 400/601 Central Avenue	Springfield	TN	37172	615/384-4572	615/384-3336	# 902
Tennessee Valley Authority	Ms. Terrye Whitaker	400 Summit Hill Drive	Knoxville	TN	37902	615/632-6435	615/632-6128	# 907
Kellwood Apparel Group	Mr. Howard Minnick	102 Factory Street	Greenfield	TN	38230	901/235-2231	901/235-2654	# 937
*	Mr. David Lefkoff	2301 East 28th Street	Chattanooga	TN	37407	615/622-3126		#1198
TeNac, Inc.	Mr. James Thornton	P.O. Box 38/3001 Mountain View	Morrison	TN	37357	615/668-3903	615/668-4241	#1228
Wellington Leisure Products	Mr. John Snipes	740 Brents Road	Lewisburg	TN	37091	615/359-4928	615/359-5039	#1298
Sierra Western	Mr. Carlos Sierra	2430 Texas	El Paso	TX	79901	915/542-3854	915/542-0195	# 734
Amer. Recreation Products	Mr. Larry Thomas	2125 West Broad Street	Mineola	TX	75773	*	*	# 824
Weslaco Manufacturing	Mr. David McKinney	1711 E. Pike	Weslaco	TX	78596	210/968-4551	*	# 835
Hexcel	Mr. Frederick R. Vees	2301 Hwy. 46 N.	Seguin	TX	78155	512/379-3592	512/379-6838	# 840
William Carter Company	Mr. Frank C. Pina	2810 N. Expressway 77	Harlingen	TX	78550	210/425-5524	210/425-5524	# 851
Parker School Uniforms	Mr. Ed Fowler	1717 W. Webster/ Box 130469	Houston	TX	77219	*	*	# 901
Tony Lama	Mr. Ray Gutierrez	1137 Tony Lama Street	El Paso	TX	79915	800/347-5262	915/778-5237	# 939
Cheerleader/Team Mates	Mr. Clint Anstaett	1411 Flat Creek Road	Athens	TX	75751	214/675-2855	800/972-0858	# 950
Levi Strauss & Co.	Mr. Roland C. Avilé	Technology Center	Richardson	TX	75081	214/234-2030	214/497-7069	# 954
Haggar Apparel Company	Mr. Steve Bernier	6113 Lemmon Avenue	Dallas	TX	75209	214/956-4537	*	# 977
Barry de Acuña, S. A.	Mr. David Solis	HCR No.2, Box 23 H, Middle Loop Rd	Del Rio	TX	78840	210/775-7241	*	#1067
MFI International, Inc.	Mr. Barry Levine	9570 Pan American Drive	El Paso	TX	79927		915/858-8827	#1092
Pyke Mfg. Company	Mr. Gilberto Ferreira	1025 S. 700 West/Box 30326	Salt Lake City	UT	84130	801/973-2200	801/977-1223	# 909
Yes Trading	Mr. Pat Struhs	404 West 400 South	Salt Lake City	UT	84101	801/532-5422	801/532-1662	#1085
Beehive Clothing	Mr. Kenneth V. Rosvall	3880 W. 1820 S. / P.O. Box 27287	Salt Lake city	UT	84127		801/972-0269	#1157
Morton International M/S 1495	Mr. Ivan Lindsay CPIM	3350 Airport Road	Ogden	UT	84405	801/734-6204	801/734-6216	#1230
Maid Bess Corporation	Mr. Dick Robers	895 Cleveland Avenue	Salem	VA	24153	703/389-8113		# 643
Bassett-Walker	Mr. Bruce Moss	P.O. Box 5423	Martinsville	VA	24115	703/632-3601	703/632-5574	# 876
Donkenny Apparel, Inc.	Mr. Allen Johnson	635 Industry Road	Wytheville	VA	24382	703/228-6181	703/228-6036	# 955
Institute of Textile Technology	Mr. Jeffrey B. Scott	P.O. Box 391	Charlottesville	VA	22902	804/296-5511	804/296-2957	#1081
NISH, Inc.	Mr. Scott Goldthwaite	2235 Cedar Lane	Vienna	VA	22182	703/207-7590	703/849-8916	#1231
London Fog	Ms. Doris Quail	40 Claremont Drive	Portsmouth	VA	23702	804/487-7028	804/487-2551	#1294
Deer Valley Apparel	Ms. Suzie Threlkeld	P.O. Box 864	Chilhowie	VA	24319	703/646-3936		#1335
Roffe Inc.	Mr. Sam M. Roffe	808 Howell Street	Seattle	WA	98101	206/622-0456	206/625-2462	# 844
Batelle	Mr. Richard J. Chidester	MSIN K7-28/Batelle Blvd.	Richland	WA	99352	509/375-6730	509/375-3641	#1190
Johnson Garment	Mr. Tom Conrad	527 3rd Avenue	Clear Lake	WI	54005	*	*	# 764
Canvasbacks	Ms. Dot Spransy	224 W. Washington Street	Milwaukee	WI	53204	414/384-4484	414/384-4549	# 889
Johnson Garment Company	Mr. James S. Johnson	P.O. Box 603	Marshfield	WI	54449	715/384-4378	715/384-5272	# 931
OSHKOSH B'GOSH, Inc.	Mr. Mark Wohosin	2660 Oregon Street	Oshkosh	WI	54901	414/231-3134	414/231-2432	# 944
Amity Leather Products	Mr. Ted Leute	P.O. Box 1990	West Bend	WI	53095	*	*	# 997
University of Wis-Stour	Ms. Donna Albrecht	Home Economics Building	Menomonie	WI	5475	715-232-2405	715/232-2366	#1182
University of Wisconsin	Mr. James Gross	800 Algoma Blvd.	Oshkosh	WI	54901	414/424-1215		#1326
Isratex	Mr. William Osborne	528 Kanawha Avenue	Rainelle	WV	25962	304/438-5442	304/438-8528	# 731

Appendix C

Survey Questionnaire

The University
Of Alabama
In Huntsville

Huntsville, Alabama 35899
Phone: (205) 895-6243
Fax: (205) 895-6733

Center for Automation
and Robotics

September 24, 1993

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

Fold

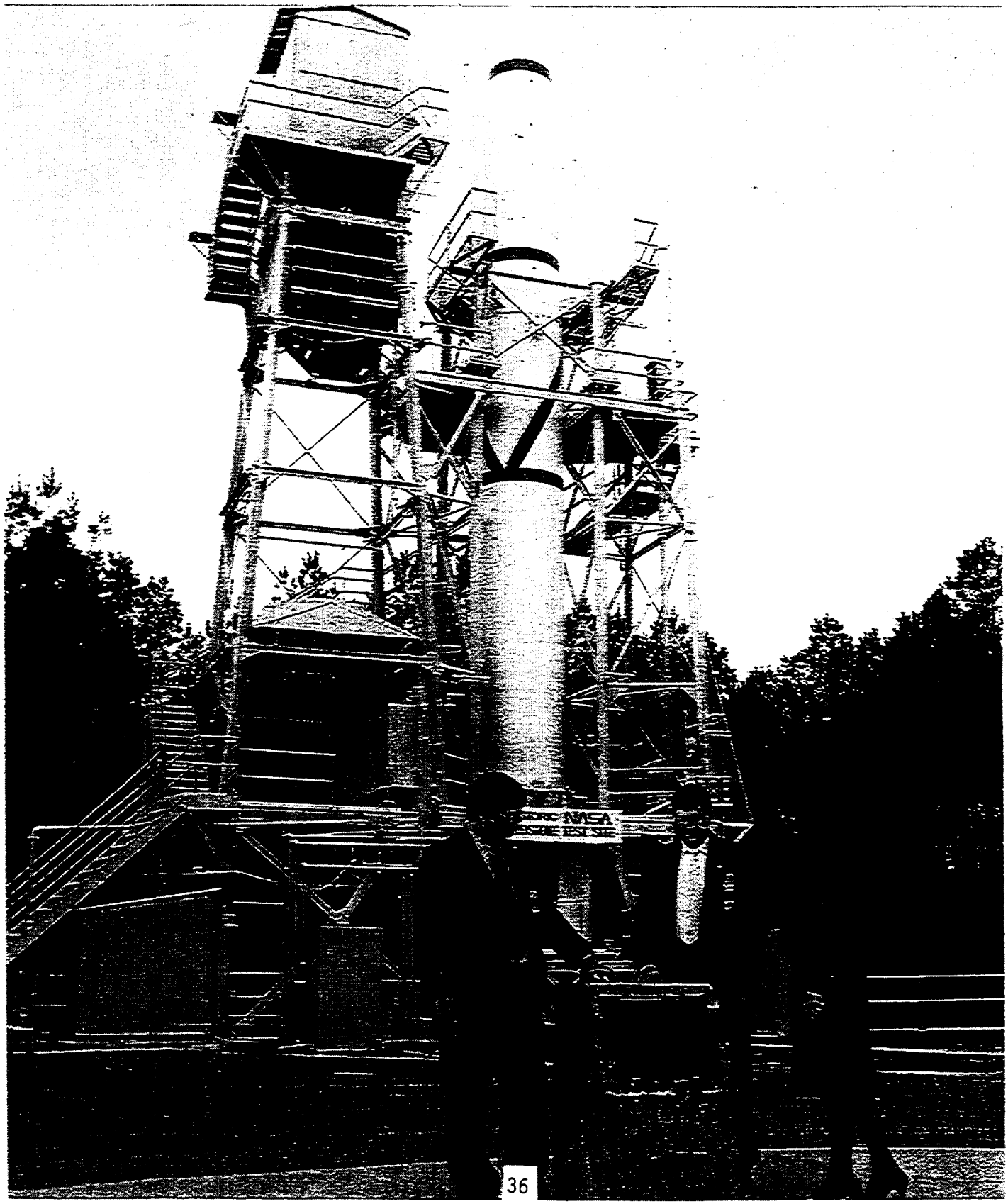
Dr. Bernard J. Schroer
Center for Automation and Robotics
University of Alabama in Huntsville
Huntsville, AL 35899

Appendix D

Articles Describing the MSFC TT Program


BOBBIN
MARCH 1993
THE PREMIER M
IRCE OF THE SEWN PRODUCTS INDUSTRY
$5.00
USA
Apparel
Technology
Primed for
BLAST-
OFF
NASA Transfers
Expertise to Industry
ALSO
Bobbin Contexpo Show
Fusing Equipment
Transportation Update

Apparel Technology



Primed For Blast-Off

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 Kappler 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.

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

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 system and sensor technology for welding air-conditioner compressors and has had contact with

Reaching Out

Branching 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. □

every supplier that does substantial work in this area. If an apparel company "wants to measure the velocity of a piece of cloth without anything touching it, for example," the researchers know exactly which suppliers can provide an off-the-shelf technology at a fraction of the cost it would take to develop something for that particular purpose. Application of the latest technology from commercial and federal sources is one of Marshall's greatest strengths, says Ziemke, "because NASA doesn't always develop new systems from scratch if they can apply and modify existing technology."

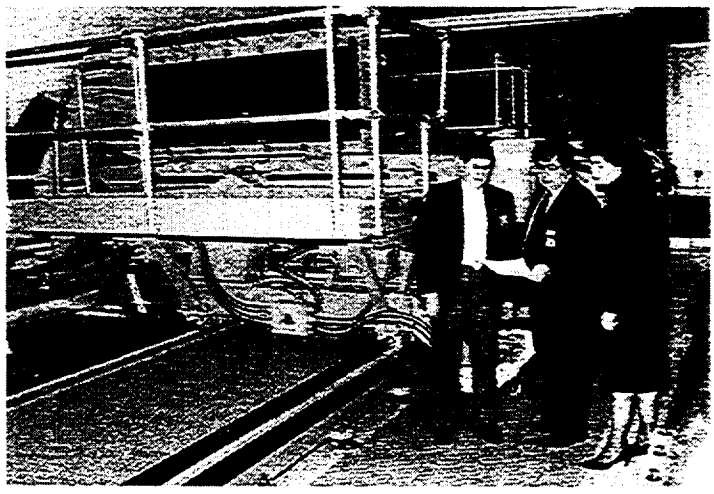
On the other hand, there are exclusive NASA developments available. One example is the power factor controller, a device developed at Marshall during the first oil crisis that reduces an electric motor's power consumption. Designed for motors that are lightly loaded and loaded only occasionally, it has been used in several sewing applications. The power factor controller was patented by NASA, and 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. Kappler 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

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 Nell Massey, manager of contract compliance.



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; data base 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 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, say 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

Searching for Answers?

Marshall Space Flight Center has seven laboratories with expertise in materials and processes, information and electronic systems, propulsion, space science, mission operations, structures and dynamics and systems analysis and integration. Some areas of NASA technology that are potentially useful to the apparel industry include:

Materials and Processes

- Process engineering
- Fabrication and assembly services
- Materials selection and control

Information and Electronic Systems

- Electrical-electronic development
- Data systems development
- Software engineering
- Guidance, navigation, control sensors and mechanisms
- Automation and robotics
- Communications systems and techniques
- Electrical power systems
- Optical systems
- Simulation systems and techniques

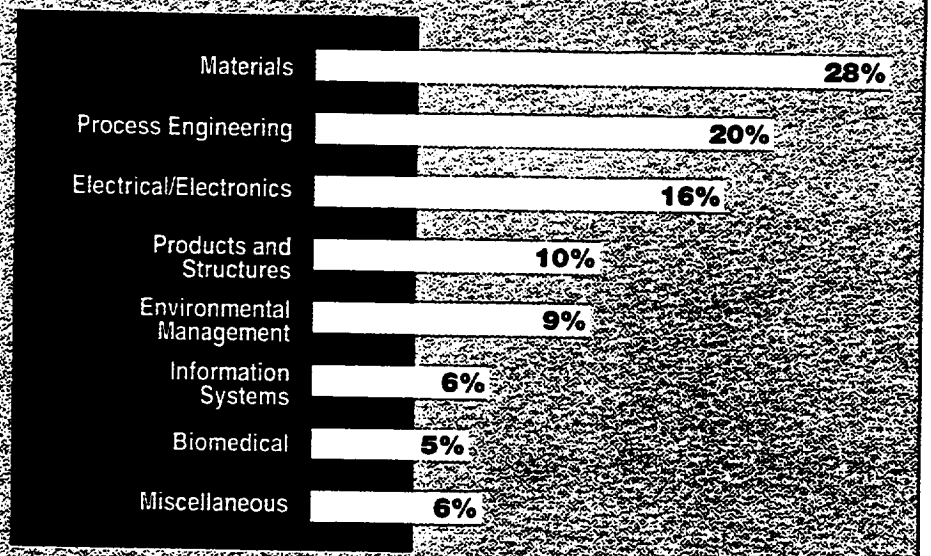
For more information on the George C. Marshall Space Flight Center and its technology outreach program, contact:

Technology Utilization Office, AT01
George C. Marshall Space Flight Center
Marshall Space Flight Center, AL 35812
Tel.: 205-544-2223; Fax: 205-544-3151

Inquiries From The Private Sector

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.

Technical Inquiries by Discipline 1990 - 1992



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.

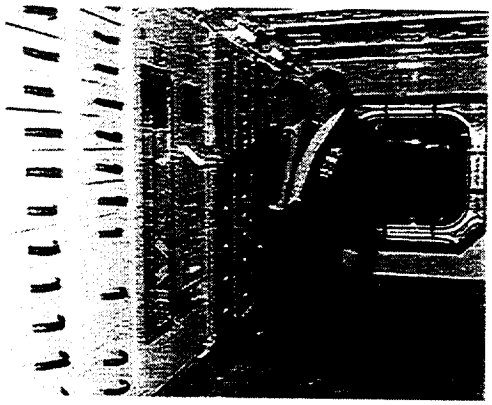
However, "If something generic works, it's not only the solution for one company, but the solution for many companies," believes Ziemke. None of the generic technologies recommended or developed by NASA are proprietary; any company has access to the information.

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. B

Lisa Cedrone is technical editor of Bobbin.



Ismail Akbay (right) and Dr. Ken Fernandez inspect the interior of Freedom's engineering mock-up.

Research and development for Space Station Freedom, one of Marshall's projects, is expected to yield technology to U.S. industry.

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 Marshal 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, bi-lingual, 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 systmes. 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

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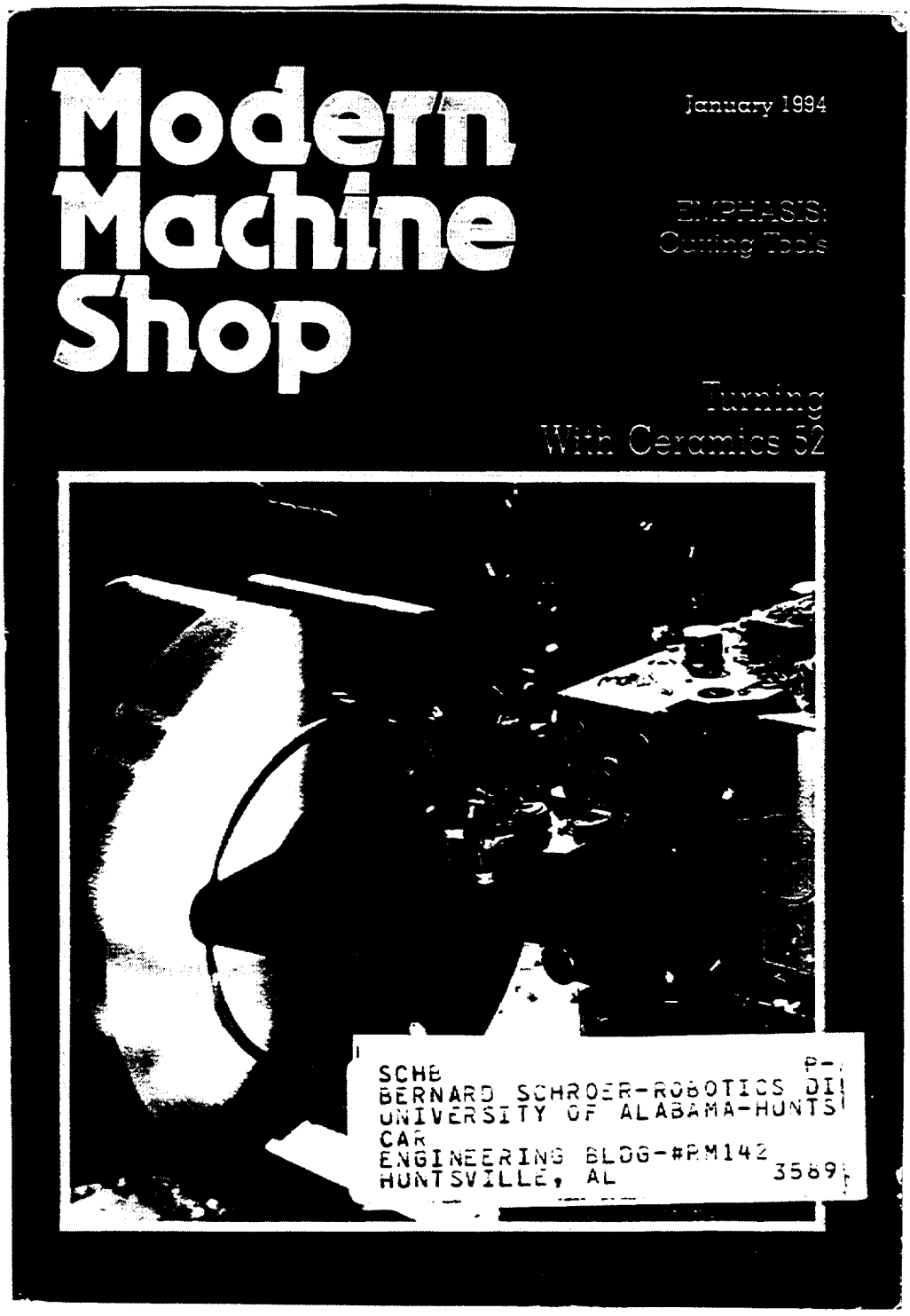
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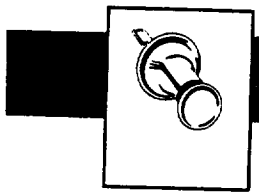


MMS Bulletin Board

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 Frassetto 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 Whitnon 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 techncial 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 thjs 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

NASA Center Offering Free Assistance To Manufacturers

by

M. Carl Ziemke

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.

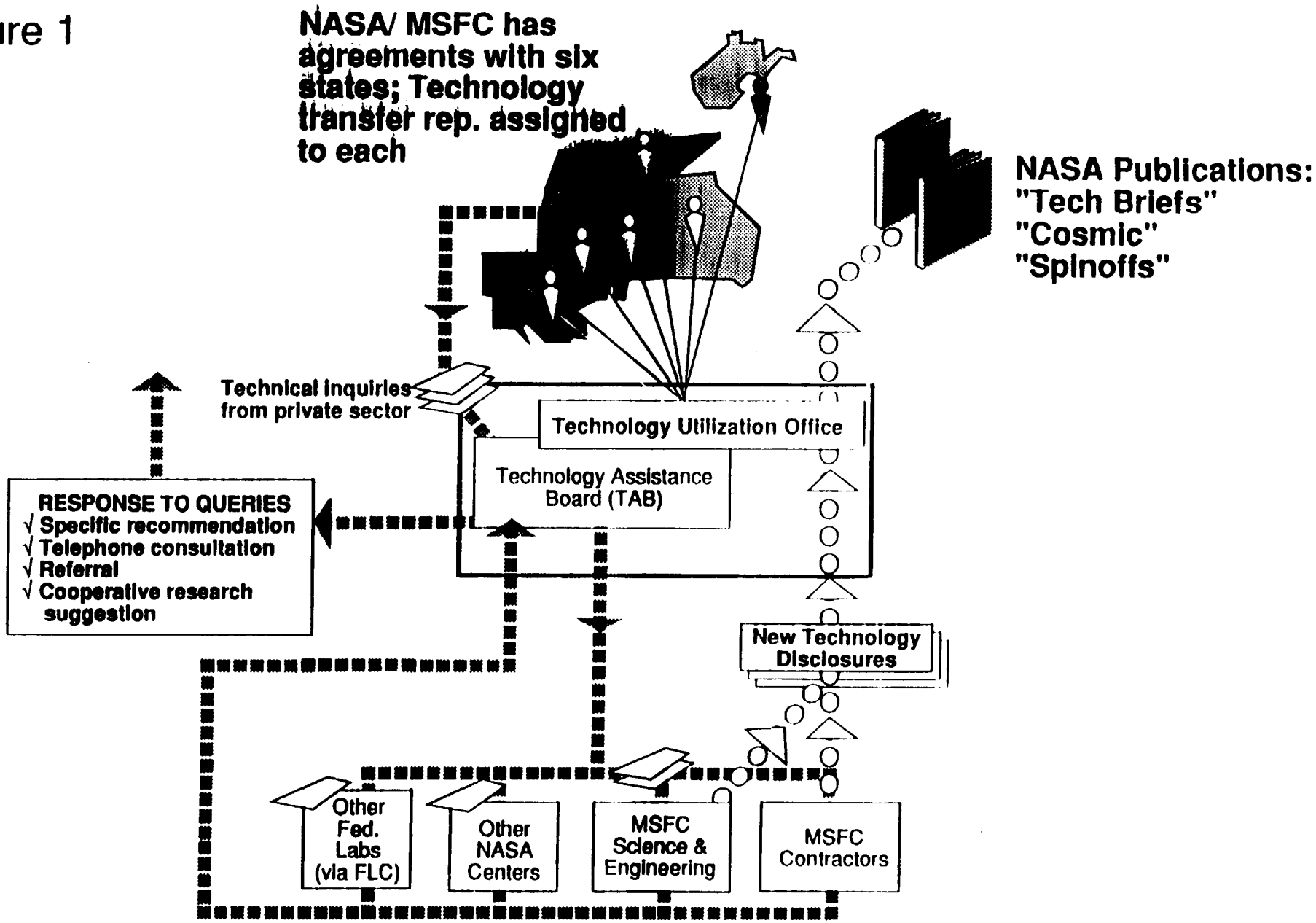
As a consequence of this cooperative effort, MSFC/TUO has received more problem statements from Alabama than any other state. This office has signed Memoranda of Understanding (MOU) on technology transfer from governors of six Southeastern states. However, requests for assistance (problem statements) 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 2½ 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

Figure 1



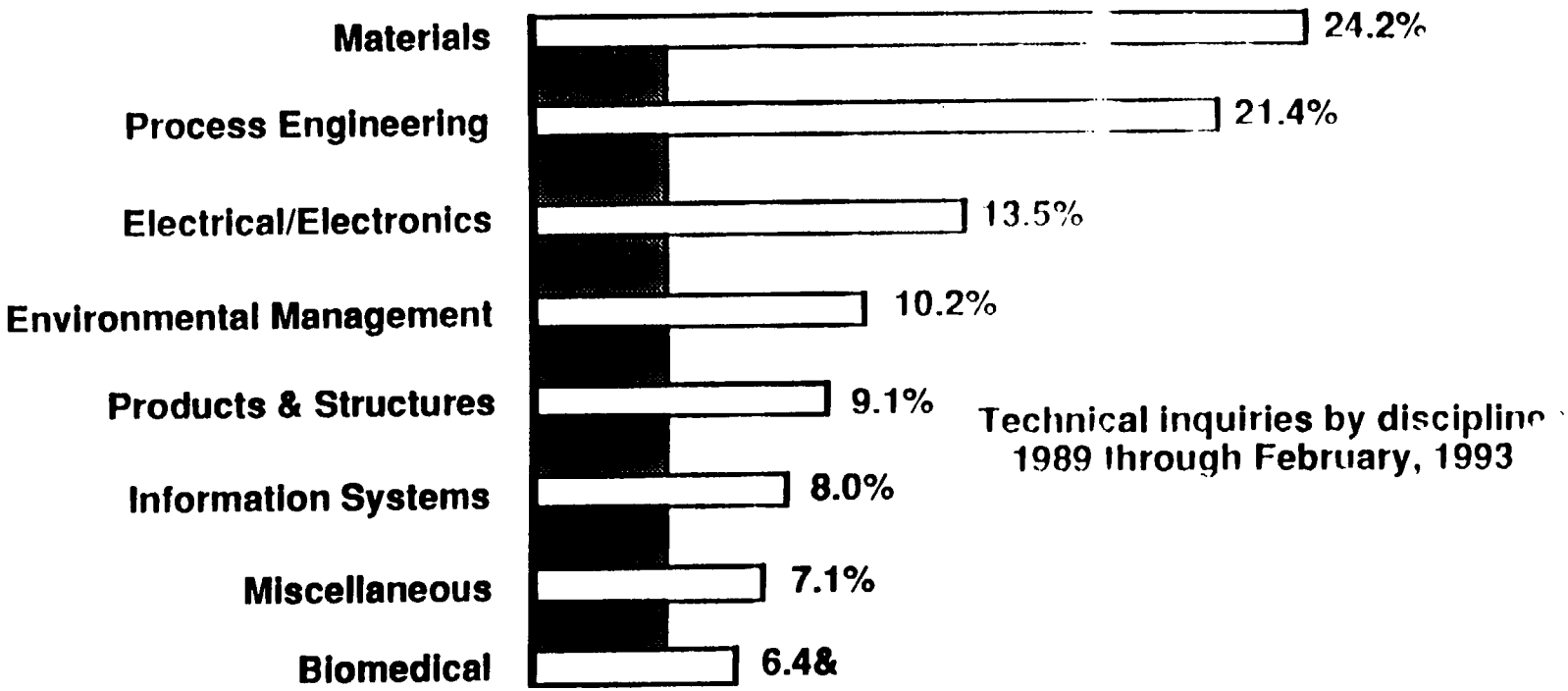
Transferring Technology from NASA to the Private Sector

The Marshall Model

January 1993

Figure 2

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)

Figuure 3

TECHNICAL REQUEST/PROBLEM STATEMENT

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

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 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) 461-7558

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

SEMINAR
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

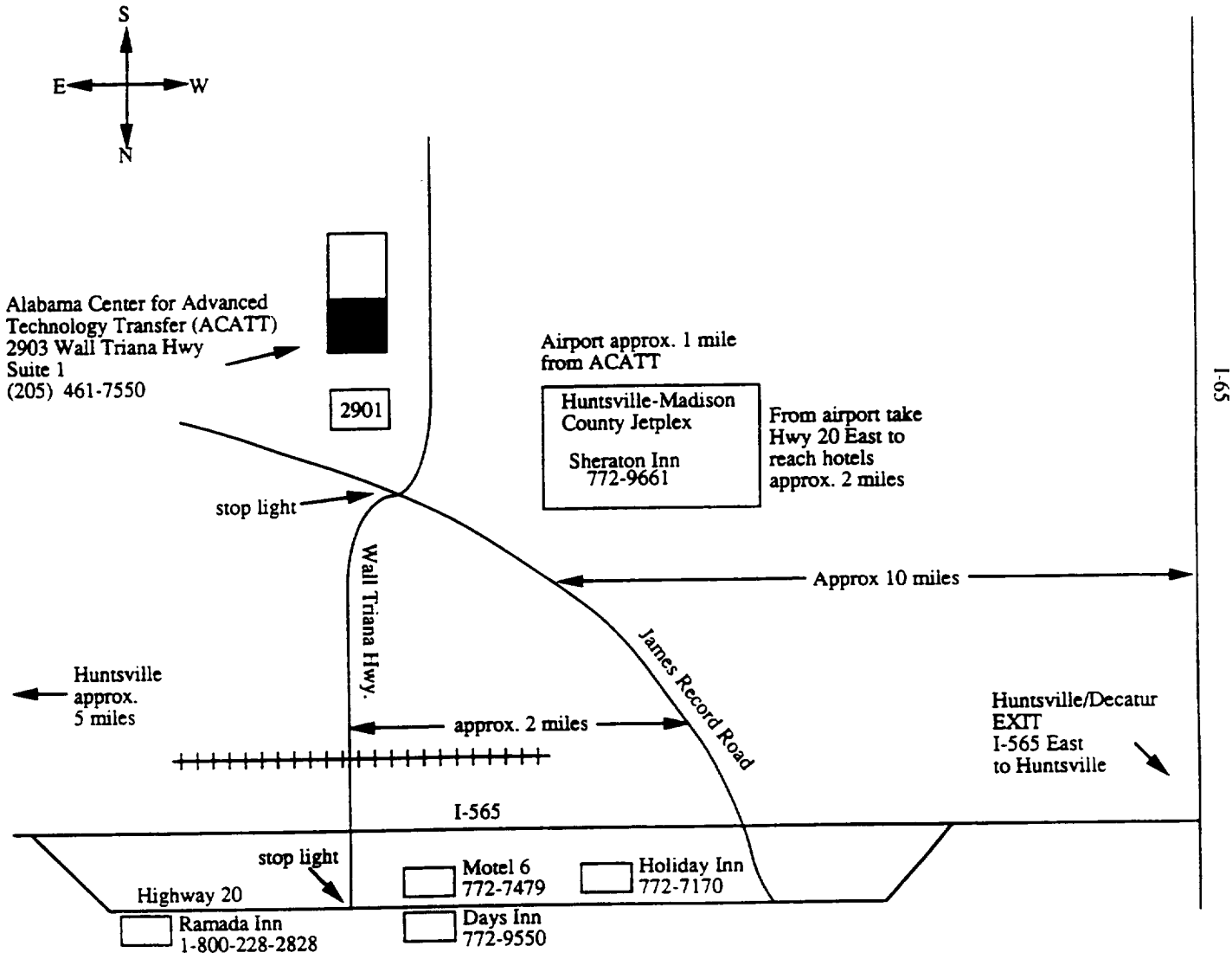
TIME:

October 26	October 27
Registration 8:00 - 8:30 am	Seminar 8:00 - 12:00 am
Seminar 8:30 am - 4:00 pm	
Lunch provided	

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.

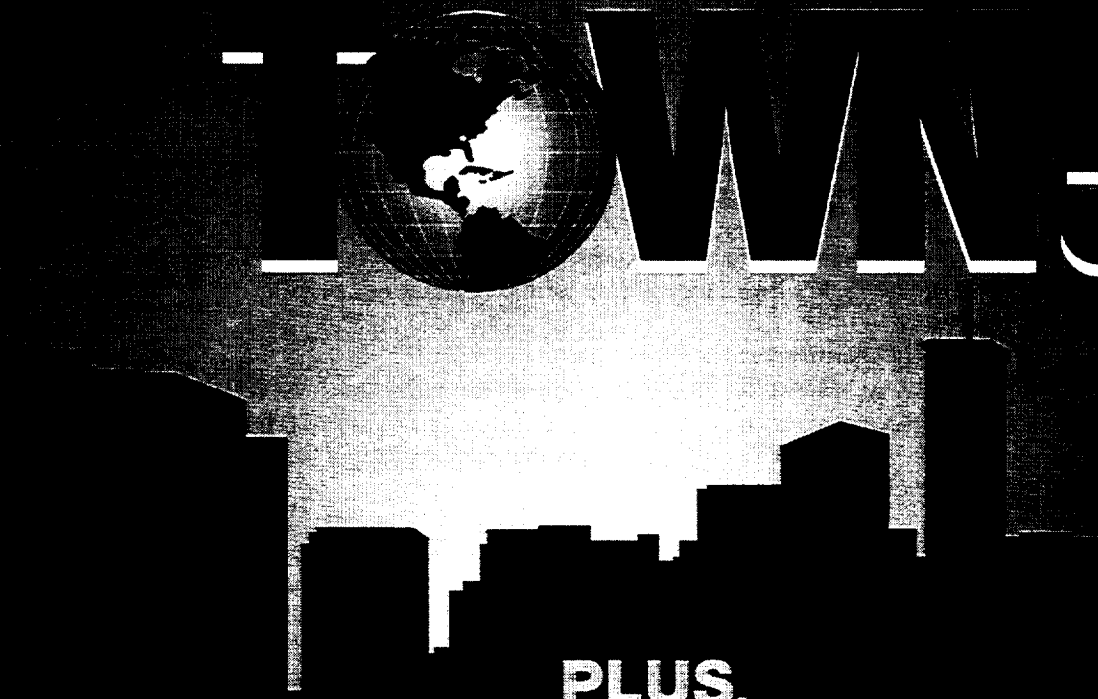
Return to:

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

BOBBIN SHOW

AAMA CONVENTION

LARGEST SHOW IN THE WORLD



PLUS,

Two Exciting Shows Within THE Show:

International Sourcing/Contractors Section and The Fabric Connection

Attendee Planning Information

S8

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.

S9

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.

S10

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

S11

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.

S12

Synchronous Manufacturing

Director: John W. Covington, 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.

3:45 p.m. - 5:15 p.m.

S13

807 (9802) — What You Must Know

Director: Norman E. Gelber, President Customs and Trade Services Inc.
Audience: Business executives with responsibilities in offshore production, including customs and transportation
Level: Basic

This session will help participants prepare *before* beginning 807 production. Of special interest will be examples from others who have succeeded or failed. Analysis and samples of the paperwork which is required for 807 will be distributed.

Comparisons of freight alternatives, common problems and practical solutions will help executives use 807 effectively for production needs.

S14

One-Page Management

Director: Dr. Riaz Khadem, President Infotrac, Inc.
Audience: CEOs and senior industry executives
Level: Basic

It's a total management solution that enables an organization to capture the power of information and maximize the potential of its people.

Use this time to gain information about a unique process that brings about positive change in the plant. It can and will make a difference.

S15

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.

NUMBER	ATTENDEE NAME	TITLE	TELEPHONE	FAX NUMBER	COMPANY NAME	ADDRESS	CITY, STATE & ZIP CODE	REMARKS
60287C	ADAMS;DOUG	DIR-MFG SUPPORT	704 522-5865	704 522-4731	CHF INDUSTRIES	8701 RED OAK BLVD	CHARLOTTE, NC 28217	
15645	ALBRECHT;DR D	PROFESSOR	715 232-2405	715 232-2366	UNIV WISCONSIN-STOUT	HOME EC BLDG	MENOMONIE, WI 54751	
60318	BONI;MARY	COORD FASHION D	604 599-2551	604 599-2578	KWANTLEN COLLEGE	PO BOX 9030	SURREY BC, CANADA	
60073	BOULTER;STEVEN L	PROJECT ENGINEE	503 238-5620	503 238-5887	JANTZEN	PO BOX 3001	PORTLAND, OR 97208	
60308	BOYNTON;MALCOLM	PLANT MANAGER	802 222-4751	803 222-5781	CCM/MASKA US INC	PO BOX 381	BRADFORD, VT 05033	
60361	HUANG;BRUCE	MFG ENGR	303 373-7509	303 373-7343	SAMSONITE CORP	11200 E 45TH AVE	DENVER, CO 80239	
60276A	JUSTICE;MIKE	PLANT MANAGER	404 957-3981	404 957-8728	DOWLING TEXTILE MFG	PO BOX 598 615 MACON RD	MC DONOUGH, GA 30253	
34081	LINDSAY;RODGER M	ENGINEER			JAMPRO CORP	35 TRAFALGA RD	KINGSTON, JAMAICA	
60249	MONKS;ROGER W	SR VP MFG/OPERA	617 499-6204	617 491-8298	STRIDE RITE	5 CAMBRIDGE CTR	CAMBRIDGE, MA 02142	
60078	MUSSIG;FRED	INDUSTRIAL ENGI	314 732-4411	314 732-5211	PARAMOUNT HEADWEAR	PO BOX 98	BOURBON, MO 65441	
60115A	MYERS;KEVIN	MIS DIRECTOR	314 225-9400	314 225-9854	WESTERN TEXTILE	3400 TREE COURT IND BLVD	ST LOUIS, MO 63122	
60252	PATTERSON;REECE	ENGINEER	615 569-9100	615 569-9103	DENIM PROCESSING INC	PO BOX 4450	ONEIDA, TN 37841	
60080L	PROCTOR;LINDA	PROGRAMMER/ANAL	513 898-1949	513 898-2848	LION APPAREL	PO BOX 14576 3401 PARK CENTER DR	DAYTON, OH 45413-0576	
60173D	REECE;LUTHER	CORP ENGR	314 576-3258	314 576-3375	KELLWOOD CO	PO BOX 14374	ST LOUIS, MO 63178	
60311	SMITH;VIVETTE	ADMINISTRATOR	809 923-5700	809 923-5776	APPAREL TECH CENTRE	76 MARCUS GARVEY DR	KINGSTON, JAMAICA	
60163	STEPHENSON;PAUL	ENGINEERING MAN	717 754-3261	717 754-7261	WRIGHT'S KNITWEAR	800 W MARKET ST	AUBURN, PA 17922	
60189	TAG;PETER H	TECH STAFF MEMB	505 667-2895	505 665-5204	LOS ALAMOS NATL LAB	PO BOX 1663 A-7 MS F607	LOS ALAMOS, NM 87545	
60361A	TARCZON;WILL	MANAGER	303 373-7122	303 373-7343	SAMSONITE CORP	11200 E 45TH AVE	DENVER, CO 80239	
60147D	TAYLOR;JEFF	PROJECT ENGINEE	416 694-2619	416 694-9835	INTL CUSTOM PRODUCTS	51 LUCY AVE	SCARBOROUGH ONT, CANADA	
60147A	THOMPSON;CRAIG	TECHNICAL	416 694-2619	416 694-9835	INTL CUSTOM PRODUCTS	51 LUCY AVE	SCARBOROUGH ONT, CANADA	
60118	TRIOLO;ANTHONY	PLANT MANAGER	603 569-3187	603 569-2146	WICKERS SPORTSWEAR	PO BOX 398	WOLFEBORO FALLS, NH 03896	
60163A	VENKAUSKAS;DAN		717 754-3261	717 754-7261	WRIGHT'S KNITWEAR	800 W MARKET ST	AUBURN, PA 17922	
60224A	WENZEL;KEN	DIR OF MANUFACT	805 483-8175		WORKRITE UNIFORM CO	500 E 3RD ST	OXNARD, CA 93032	
60361B	YAKISH;TONY	MFG ENGR	303 373-7122	303 373-7343	SAMSONITE CORP	11200 E 45TH AVE	DENVER, CO 80239	COMP

TOTAL FOR SESSION S15= 24

Appendix F

Huntsville Chamber of Commerce Operations Manual

HUNTSVILLE
The Sky is not the limit.

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

TABLE OF CONTENTS

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 an 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

- Teledyne Brown Engineering
- Alabama A&M University
- Unisys Corporation
- Huntsville Chamber of Commerce
- University of Alabama in Huntsville (UAH)
- Smith Advanced Technologies
- SPARTA, Inc.
- SCI Systems, Inc.

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 he 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

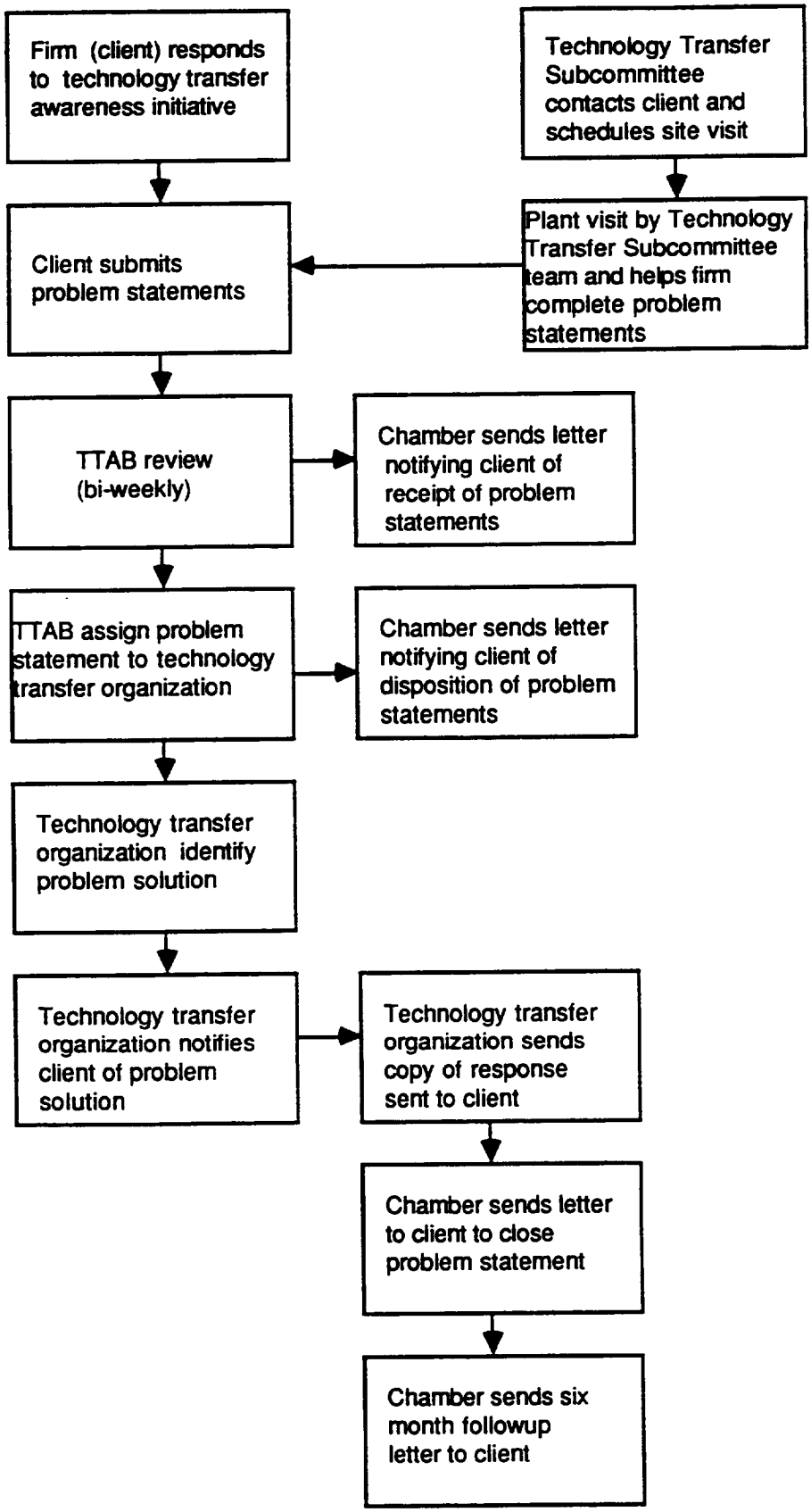


Figure 1. Technology transfer process within the Chamber of Commerce

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.

HUNTSVILLE
the Sky is not the limit.®

March 18, 1993

Dear:

Your technical request problem statements, # 33/Responce Curve for Sagnac Interferometer, #34/Polorization Induced Fading, #35/Depolorizing Technique, and #36 Tour of Composits 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

/ls

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

CHAMBER OF COMMERCE OF HUNTSVILLE/MADISON COUNTY
TECHNOLOGY TRANSFER ACTION BOARD

Phone 535-2032
Fax 535-2015

NUM	TITLE	ORIGINATOR	VISITOR	TEAM ASSIGNED	DATE OPENED	DATE CLOSED	FOLLOW -UP
001	Alternate Vapor Degreaser Process		Fernandez	NASA/Fernandez	9/23/92	7/26/93	
002	Adaption of NASA Spray Foam Insulation		Fernandez	NASA/Fernandez	9/23/92	7/26/93	
003	Flexible Re-useable Packaging		Fernandez	MICOM/Alford	9/23/92	On-going	
004	Cleaners for Electronics (Non-destructive)		Fernandez	TVA/Ryland/McCain	10/13/92	8/16/93	
005	Improved Materials for Battlefield Targets		Fernandez	NASA/Fernandez	10/13/92	5/11/93	
006	Automatic Wiring Harness Technology		Fernandez	MICOM/Alford	10/13/92	4/28/93	
007	Paints with High Thermal Signature		Fernandez	MICOM/Alford	10/13/92	Need Let.	
008	Corrosion Protection for Shipboard System		Fernandez	MICOM/Alford	10/13/92		
009	Digital Radio Control for Remote Devices		Fernandez	SSDC/Alexander	10/13/92	5/18/93	
010	Low Cost Conductivity Meter/Sensor		Fernandez	NASA/Fernandez	11/10/92	8/9/93	
011	Sprayable/Paintable Rust Inhibitors		Fernandez	MICOM/Alford	11/10/92		
012	Improved Detergents for Industrial Cleaners		Fernandez	MICOM/Alford/McCain	11/10/92		
013	New Product Development		Alford	MICOM/Alford	11/13/92		
014	Need Improved Methods for Bid Preparations		Alford	TBD	11/13/92	Need Let.	
015	Assistance in Entering Wiring Harness		Alford	MICOM/Alford	11/13/92		
016	Information on Post Award Debriefing		Alford	MICOM/Alford	11/13/92	Need Let.	
017	Improved Wiring Harness Manufacturing		Alford	MICOM/Alford	11/13/92		
018	Assistance in Establishing a CRADA		Alford	MICOM/Alford	11/10/92	5/18/93	
019	Continuously Variable Time Delay of RF		Alford	NASA/McCain	11/5/92	9/2/93	
020	Solid State Diode Pump Laser		Fernandez	SSDC/Alexander	2/3/93	8/17/93	
021	Remote Melting and Piping of Pitch		Schroer	NASA/Fernandez	2/19/93	5/11/93	
022	Molding of Asphalt Based Pitch		Schroer	NASA/Fernandez	2/19/93	5/11/93	
023	Selection of Potting Compound		Schroer	NASA/Fernandez	2/19/93	5/11/93	
024	Virtual Reality Consortium		Schroer	MICOM/Alford	2/12/93	5/18/93	

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

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

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

HUNTSVILLE
The Sky is not the limit.

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

PUTTING TECHNOLOGY TO WORK FOR YOU

A Guide to Technology Assistance

HUNTSVILLE
The Sky is not the limit.

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 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.

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.

Appendix G

Huntsville Chamber of Commerce New Releases

HUNTSVILLE
The Sky is not the limit.

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.

Federal laboratories participating in the program are NASA's Marshall Space Flight Center, TVA National Fertilizer and Environmental Research Center, U.S. Army Missile Command and U.S. Army Space and Strategic Defense Command.

"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:

SIC	Description	Number of Firms
2200	Textile mill products	1
2800	Chemical and allied products	1
3400	Fabricated metal products	2
3500	Industrial machinery and computer	2
3600	Electronic and electrical equipment	4
3700	Transportation equipment	4
3800	Measuring and controlling instruments	3
4911	Electric services	1
8062	General medical and surgical hospitals	1
8711	Engineering services	3
8731	Commercial physical research	3
		25

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:

- 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:

SIC	Description	Number of Firms
2200	Textile mill products	1
2800	Chemical and allied products	1
3400	Fabricated metal products	2
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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.

Huntsville Chamber of Commerce

Making the Connection with Technology Transfer

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 MICOM, at SSDC, 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 _____

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)*

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

Technology Transfer Rep. _____ Phone: ( ) _____

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- 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

Huntsville Chamber of Commerce draft 11/3/93
Technology Transfer Program
Update

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.

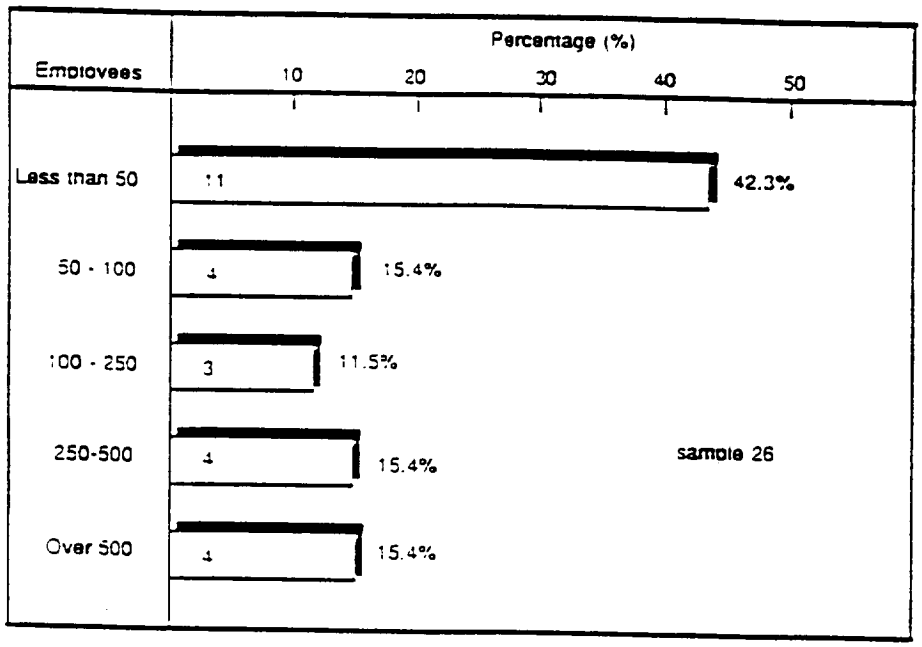
Firms submitting requests include:

- 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

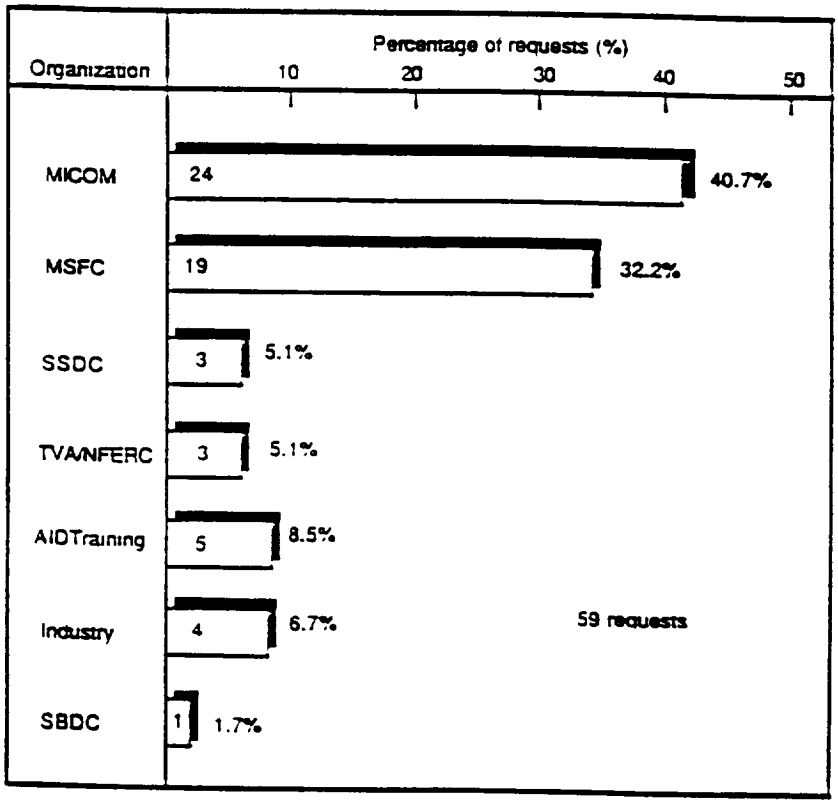
The majority of the requests have come from Engineering Service firms (SIC8711 and 8731), Electronic and Electrical Equipment companies (SIC3600) and Transportation Equipment companies (SIC3700).

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.



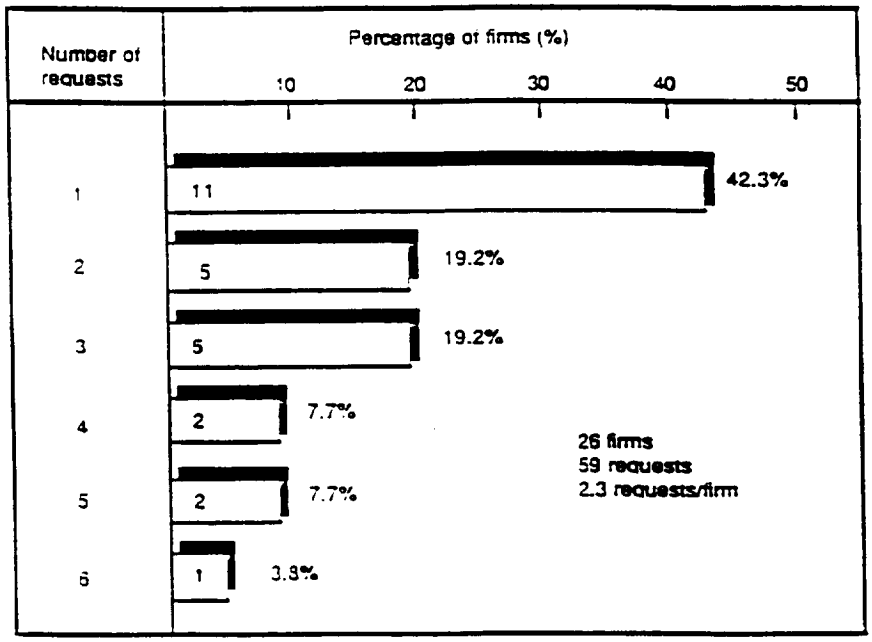
Requests by firm employment



Organizations responding to requests

Firms submitting requests by SIC code

SIC	Description	Number of firms
2200	Textile mill products	1
2800	Chemical and allied products	1
3400	Fabricated metal products	2
3500	Industrial machinery and computer	2
3600	Electronic and electrical equipment	4
3700	Transportation equipment	4
3800	Measuring and controlling instruments	3
4911	Electric services	1
8062	General medical and surgical hospitals	1
8711	Engineering services	3
8731	Commercial physical research	3
		25



Requests submitted by firms

HATS Highlights
Nov./Dec. 1993
Published for Members of the Huntsville Association of Technical Societies

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 aeronautic 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 *AIAA*

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

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...Commercial Bank Center, ... Washington St. (corner of Washington and Monroe streets). HATS is a co-sponsor of this event. Reservations: 837-4287 by Nov. 5.

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."

Requests for company assistance are 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 to make suggestions concerning 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.

Federal laboratories participating in the program are NASA's Marshall Space Flight Center, TVA National Fertilizer and Environmental Research Center, U.S. Army Missile Command, and U.S. Army Space and Strategic Defense Command.

"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.

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