



QUARTERLY STATUS REPORT NO. 8
1 January 1967 - 31 March 1967
Contract Numbers NASr-178
and NSR 37-004-006

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by
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P R E F A C E

This Quarterly Status Report covers Center activity from 1 January 1967 through 31 March 1967. The report was prepared by Lee B. Zink, Director of the Center, with the cooperation of the entire staff. It is the eighth quarterly report of activity on Contract No. NASr-178. From February 1964 through March 1965, Monthly Status reports were submitted. It is the third quarterly report of activity on Contract No. NSR 37-004-006.

April, 1967

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S U M M A R Y

Work of the Center progressed satisfactorily during the quarter. Two seminars to acquaint additional firms in the Project Area with TUSC services were held. A project to serve firms at some distance from the Center by mail and telephone has been initiated. Twenty (20) specific transfers of technology were reported.

The economics staff of the Center has been instrumental in preparation of the Overall Economic Development Plan for the Kiamichi Economic Development District of Oklahoma. Two additional research projects aimed at identifying specific problems of economic growth are underway. Work on updating the published data continues to progress satisfactorily.

Technology Utilization Program

During the quarter the technology utilization phase of the TUSC program maintained satisfactory progress. Some eight new individuals or firms utilized TUSC services during the period.

Some 803 individual mailings were made to firms during the quarter. Of these, 631 were in response to requests for technical information and 172 were mailed under the selective dissemination program.

The following is a continuation of the reporting procedure for transfers of technology established in Quarterly Status Report Number 2 and continued in subsequent reports. The first section involves the updating of previously reported transfers. The numbers used are those given the transfer when originally reported.

34. The peanut drying project continues to look very promising. Through one of our Industrial Specialists, Mr. A. M. Moore, TUSC is becoming increasingly involved in the attempt to bring modern technology to bear upon an antiquated processing problem of the peanut industry. Mr. Moore has been named Chairman of a Technical Committee appointed by the Chairman of the Oklahoma Peanut Commission. This committee has issued "invitations to propose" to industry and universities to engage in research aimed at the solution of this problem. Ten organizations, including two giants of the aerospace industry, have indicated that they will propose a development project which will employ a modern approach to this heat transfer problem.

A further background of the problem follows. An estimated 90,000 tons of peanuts are mechanically dried out of a total production in Oklahoma of approximately 110,000 tons per year. Present methods of drying require from 30 to 70 hours to dry a batch of approximately 5 tons. Threatening weather may speed up a normal harvest and practically inundate the drying facilities. Bulked green peanuts will mold and lose their value in a matter of hours if weather conditions are not favorable. Losses may run into a considerable figure when the product is worth about \$230.00 per ton.

The Oklahoma Peanut Commission is a private organization of farmers. It is financed by a voluntary assessment of \$1.00 per ton, per farmer. No public funds are involved in the research work of the Commission.

TUSC continues to hope for a very significant development in this field.

69. Problem - A client stated that he needed a means for determining the relative humidity of air after it was heated for conventional peanut drying.

Solution - TUSC provided him with a psychrometric chart and instructions for employing the chart.

70. Problem - How to etch stainless steel.

Solution - The client states that the information he received through report N66-13249 saved him at least sixty days work. He would not have had time to do the work saved by this report; consequently, his company is able to move into the civilian market with an orthodontic device which costs, under present tech-

nology, approximately \$600.00. The etching technique they use with stainless #304 allows them to fabricate a better item that will retail at approximately one-tenth of the present cost. They believe their innovation will be applicable to other civilian usage.

The firm was supplied with fifteen abstracts covering the subject of "chemical milling of #304 stainless steel." We also called the client's attention to five articles in the 1966 issues of Materials in Design Engineering. He requested and received five reports outlined by these abstracts. He said that several of the reports and articles gave him much needed background information. He attributes the success of his project to the report N66-13249, and to Part II of report N66-26277. He foresees \$100,000 worth of civilian business over the next few years resulting from this technology transfer. (It should be noted that the client is highly elated at this time and this figure should not be taken too literally at this stage in the transfer.)

71. Problem - What is the latest information on interstitial atom diffusion in face-centered cubic metal?

Solution - Fifty-nine abstracts were retrieved in a combined hand and computer search. This was one of the most difficult searches TUSC has conducted. Our hand-retrieved abstracts were mailed 7 November, and the computer search results were mailed 16 January. As yet, we have no indication from the client as to the pertinence of the abstracts.

72. Problem - A client noticed a report in a weekly newsletter which he wanted. The letter did not give an accession number. The

client gave us the name of the author and the subject matter covered in the report.

Solution - In the "author index" we found a reference to the report and the contract number. Through the contract number we were able to trace the originator to the Naval Avionics Facility, Indianapolis. We got the report to the client within ten days.

73. Problem - To explore different methods of fire and theft detection by means of infrared light sources.

Solution - A client asked that TUSC search for information on infrared that would pertain to theft and fire detection. He owns a chain of open front grocery stores, and is in the process of opening a coin-operated popular item grocery. He anticipates the theft rate to be exceptionally high in this type operation because no attendants will be used after 10:00 p.m. or before 7:00 a.m. The equipment would be well marked as theft detection equipment to discourage any vandalism or burglary.

The client was supplied with an Edmund Catalog #665 from Edmund Scientific Company, Barrington, New Jersey, and a copy of NASA report N66-29387, "An Expansion of the E. V. System."

74. Problem - To find an economical process and material to make numbers for branding cattle.

Solution - The Durant Animal Hospital asked TUSC to find an economical process to make numbers for branding. The numbers on the commercial branding iron are priced at \$7.00 to \$10.00 each and they felt this was too expensive for the average farmer or rancher. A complete set of numbers would cost \$90.00 to \$100.00. The pro-

cess to be used would be a super-cooled iron cooled with liquid nitrogen which would give the animal a cold burn instead of the hot burn that has resulted in the past. The cold burn has many advantages over the hot burn, one being that the cold burn does not leave rawness that is likely to become infected. The Industrial Specialist involved had used a technique developed by trial and error which he thought would prove effective and would be easy to work. By using a commercial modeling clay and mixing asbestos particles, the material can be worked easily and is fireproof. The metal used is a babbitt material which is also easy to work. Babbitt is a lead-tin-zinc material that has a melting point of about 600° F. and can be melted and poured. After the material sets up in the clay mold, it will be tough and stable.

The firm also asked for information on other metal materials that could possibly be used. These were aluminum, copper and steel; however, the melting point of these materials is too high and it cannot be worked without special equipment.

75. Problem - To find a chemical that will dissolve calcium sulphate deposits in oil wells.

Solution - This company is seeking a chemical that can be used in oil well pumps to dissolve slag formations that build up on pump parts in oil wells. The chemical would have to be pumped down the casing to the working barrel where the formation is most prominent. The chemical desired would also have to be non-corrosive to mild steel, brass and chrome. An in-house search was conducted by TUSC and a computer search was conducted by ARAC but neither

produced any new chemical of this type. Calls were made to DuPont Company in Dallas and Houston. The Houston office referred us to the Visco Division of the Nalco Chemical Company in Houston. This company is in the business of water treatment for the oil industry and has done quite a bit of work in this field. They told us of their product, Visco 900. This product is a specially prepared formula of an inorganic dry acid containing an inhibitor against attack on ferrous metals. It is principally used for the removal of sulphate and iron deposits in equipment, producing oil wells and water injection wells. This information, plus results of a search of The Oil and Gas Journal for this type product, was sent to the client.

76. Problem - Making a decision whether to stay in the machine shop business as a job shop or change to a subcontracting facility.

Solution - At the time of the initial contact, this machine shop was doing job work. The owner was not satisfied with this type work. After an explanation of TUSC, he asked if we had any information regarding subcontract possibilities.

The Information Specialist left NASA SP-5010, "Selected Shop Techniques", and MRI report, "What's New in Welding." We also sent a list of NASA prime contractors which was secured through the Manned Spacecraft Center in Houston.

The owner contacted several companies that were doing prime contracting for NASA in regard to subcontract work. He found that this field was wide-open and decided to close his job shop and

tool up for production work. He has bought three automatic screw machines, three radial drills, and several other pieces of machine tool equipment. He is now making parachute hardware for a major aircraft company. The client gave TUSC credit for helping him make the decision to go into manufacturing work.

TUSC also sent him report N66-11907, "Metal Cutting Standards-Turning and Boring." He said this report was invaluable to his shop employees in setting up cutting speeds for automatic machines.

77. Problem - To find the specifications of a metal with characteristics which would make it suitable for bulldozer powered tree saws.

Solution - The information already provided another client in the development of his stump cutter was equally applicable to this usage. The client was provided with the metallurgical number and the supplier's name and address.

78. Problem - How to contract for research.

Solution - A six-page article in the February, 1967, issue of Research and Development magazine entitled, "Your Money's Worth from Outside Research", by Paul J. Lovewell, a recognized expert in research consulting service, was forwarded to each member of the Oklahoma Peanut Commission's Technical Committee. This was an educational effort on our part which should reap future rewards.

79. Problem - To find state-of-the-art reports on Metal Inert Gas Welding and Tungsten Inert Gas Welding.

Solution - Many improvements on the old standard ways

of welding have been made in the past few years. Modifications of conventional methods have produced many benefits in the welding field. Distortion, warpage, and speed of welding operations are just a few of the advantages of the new processes. This company asked for these reports not specifically to solve a problem, but to educate the operators.

80. Problem - To set up a kiln-drying process for sawmill operations.

Solution - The owner of an area sawmill is considering the possibilities of installing a kiln dryer at his sawmill. He asked TUSC to provide information on kiln-drying processes, temperatures that should be used, equipment needed, and acceptable moisture content in lumber. The owner is rapidly expanding his operation and in order to best utilize his equipment and provide a top-grade lumber, he feels a kiln would be necessary.

A search was made in the college library and copies of pertinent articles on kiln drying were sent to this client.

81. Problem - To find a better ink to stamp electronic parts.

Solution - After electronic components are manufactured and finished, government requirements state that these parts must be stamped with a number in ink so that the parts may be identified. This is done to simplify parts identification in case of repairs. These parts are subjected to handling, heat, and other abuses which tend to eradicate and smear the numbers. Government inspectors have not been satisfied with the ink the company is presently using. The ink they use now is an epoxy ink.

A search request was submitted to ARAC and a hand search was done by TUSC. Neither revealed any information in this field.

A search was done in Material in Design Engineering, and Modern Plastics, and quite a bit of information was found on commercial inks for the purpose of marking metal parts. The company is in the process of contacting suppliers of commercial inks. The company appreciated the services TUSC had rendered because they had neither the publications to search, nor the time.

82. Problem - To locate information on high resolution photography.

Solution - A client is in the photography business specializing in high resolution photography. He has developed and patented a machine for the development of large photographs. He has also asked that we contact NASA officials for the possibilities of his doing work for NASA.

A search was done on high resolution photography and fifteen abstracts were sent to the client.

83. Problem - To find strong epoxy adhesives.

Solution - During oil well drilling operations, it is necessary to set casing in order to seal off undesirable elements from the hole. The casing also serves as a guide for the drill pipe during drilling operations. After the initial hole is drilled, the hole must be reamed to the size of the casing. The casing is then screwed together and at the present time must be welded before it can be lowered into the hole.

An epoxy cement that would be durable and strong enough could be used in the threads to block them together permanently and eliminate welding the joints together. A search was made in STAR and IAA and the company was sent twenty-seven abstracts. They ordered three reports, SP-5066, "Adhesives, Sealants, and Gaskets", N66-21445, "Epoxy Compounds and Their Applications", N66-31240, "Locking of Threaded Fasteners."

84. Problem - To find a better thread to sew work gloves.

Solution - A thorough search was made in STAR and IAA plus the auxiliary library. Very few abstracts were found and only one seemed to be of a useful nature. The company is having a problem finding a suitable thread which is fireproof and also durable enough for heavy work glove construction. NASA report N66-36227, "Development of Revised Simplex Fabric for Summer Flying Gloves", came to our attention as a result of the search and was sent to the company. This report deals with a knitted fabric which was developed for use in flying gloves which would give better protection in the event of exposure to flames or extreme heat. This report was in the exact area of the company's interest.

85. Problem - To find a better method of brazing electronic parts.

Solution - This company is constantly looking for better methods of brazing small electronic parts. NASA report N67-12705, "Induction Brazing", came to our attention through an Industrial Application Report, and a copy of the abstract was sent to them. Induction brazing is a process which utilizes the capillary flow

to insure greater surface area and additional strength, resulting in a better weld. This process has the advantage of low temperature which minimizes warpage and prevents destruction of electronic parts. The company indicated that they are interested in any reports of this type that can be supplied and plan to utilize the information.

86. Problem - To find better methods of linear and mathematical computer programming.

Solution - The company asked us to find information on the latest techniques of computer programming. This type program is designed to improve the efficiency of scientific computing and system programming by automatic techniques. Thirty-one abstracts were sent by TUSC and 102 abstracts were sent as a result of the ARAC search. As yet, no assessment of these reports has been given.

87. Problem - To locate information on spray nozzles which mix plastic resins and additives with conventional spray guns.

Solution - NASA Tech Brief 63-10318 was located. This Brief completely illustrates a new type nozzle. Also a search was made in Modern Plastics which revealed several types of spray guns now on the commercial market.

88. Problem - To find suitable study material for electronics students at the Oklahoma School for the Deaf.

Solution - As a result of the Ardmore Chamber of Commerce - TUSC meeting in Ardmore, instructors at the Oklahoma School for the Deaf noticed electronics material published by NASA. NASA SP-5002, "Reliable Electrical Connections", was especially noticed since it

is very thorough. It was brought out that deaf students are much harder to teach than normal students and the SP was well illustrated and comprehensive. The school was given twelve copies of the SP and they plan to use it as a textbook. We also secured NASA training film through Marshall Space Flight Center. The film will also be used as a training aid.

Economic Data and Research Services

The TUSC economics staff has provided assistance to the Executive Director of the Kiamichi Economic Development District of Oklahoma in the preparation of their "Overall Economic Development Plan." This assistance was based upon previously developed economic data from TUSC's own program. TUSC assistance in this venture avoided unnecessary duplication of information already available. Much time, effort, and money was saved due to our earlier work.

Professor Warren has another research project underway which, when completed, should prove very useful. This is an examination of employment changes that have occurred in Oklahoma counties over the 1940-1960 period. Data recently published by the U. S. Department of Commerce provides a convenient technique for analyzing differences in growth rates among regions. The research effort is directed to the question of why a region (county) grows more or less rapidly than other counties or than the nation. Growth elements are broken down into industrial mix and regional share effects and are then analyzed.

Professor Warren also has underway a larger study which will not be completed for several months. The objective of this study is to identify and measure those factors which contribute to the differences among county areas in the level of per capita local governmental expenditures. Local governmental activity provides the environment in which the private sector functions. This environment, which is a reflection of preferences that consumers have for public services, may be a crucial ingredient of economic growth.

Variation in the consumption of public services at the county area level is subjected to multivariate statistical analysis. The analysis proceeds first to identify and measure the social, economic, physical, and institutional variables that contribute to different levels of local governmental expenditures on education, highways, police protection, fire protection, sewage and sanitation, and general control. Then the data are analyzed on a grouping of counties into state economic areas to determine if there is a regional effect associated with the expenditure levels. The technique yields a method whereby expenditure levels can be compared after taking into consideration those variables that account for differences among regions.

The study should reveal a relationship between various measures of economic growth and the socio-economic environment of the region.

Again, the completion of these studies will assist in isolating the variable we want to examine in greater detail - the impact of technology on the region.

General Center Functions

The college aviation program continues to attract national interest. Officials from Louisiana Technical College visited the Southeastern campus to view its operations. They are contemplating a similar program.

During a recent visit to Washington, D. C., Mr. Zink visited at some length with officials of the Ozarks Regional Commission. Part of the purpose of these visits was to assure that these officials are aware of the TUSC program and its potential impact on the entire area. We have established an excellent relationship with this organization which should show considerable results in the future.

During the quarter we were visited by a representative of the Texas Electric Service Company of Fort Worth. He had read about our services in some of the national publicity the Center has received as a result of our peanut drying project. He was interested in what services we could provide to his area. We are exploring some ideas in that field.

Staff members continue to be asked to speak at civic clubs regarding TUSC functions. Mr. Zink spoke before the Associated Industries of Oklahoma at Muskogee in March. Messrs. Moore and Carpenter presented programs for the Durant Evening Lions Club and the Coalgate Lions Club in February.

TUSC Staff

No changes have occurred relating to staff positions during the quarter.

Specific Report Relating to Statement of Work in NSR 37-004-006

The following is a report relating directly to specific projects stated in the work statement of NSR 37-004-006. Numbers used below are those used in the contract.

1. All previous sections of this Quarterly Status Report relate to this work statement.

2. To date, two such seminars have been conducted and another is in the planning stage. These seminars have been held at McAlester and Ardmore, Oklahoma. The McAlester meeting was not well-designed as to attendees and did little to further the direct efforts of TUSC. Moreover, conflicts of other meetings plus bad weather cut attendance to "old friends" of the Center. Although they indicated that the program was enjoyed and that they benefited from it, it was not satisfactory for us. Since it was the initial effort, we learned some useful lessons.

The Ardmore meeting was more promising. Five new contacts were made with firms and individuals who had not previously used TUSC services. At present, it is too early to adequately evaluate this meeting. Future quarterly reports will contain a more detailed account.

3. TUSC has established effective liaison with two participating institutions under the State of Oklahoma Technical Services

Program. These are Southwestern State College and Oklahoma State University. A seminar is in the planning stage.

4. This project started with a January meeting in Tulsa sponsored jointly by the Tulsa Chamber of Commerce and TUSC. Invitations to over 50 firms were extended; after much work, 14 firm representatives attended the meeting. From these 14 attending, 5 firms have submitted requests for information to TUSC. At present, this project has not been in effect long enough to evaluate it further.

We are disappointed by the small number of firms involved to date and plan to attempt another, similar experiment in another city.

5. Unfortunately, little real progress has been made in our efforts to establish relations with another large firm. We had been working with a large petroleum company for several months and when the decision mechanism reached the vice-presidential level, it was vetoed. So, we are in process of planning to start over again.

6. We provide continuous services to all institutions operating under the Oklahoma State Technical Services Program.

7. TUSC is currently providing information services to four faculty members at Southeastern State College, two at the University of Oklahoma, one at the University of Tulsa, and four at Oklahoma State University. Plans are underway to expand these efforts to other institutions.

8. This work is progressing satisfactorily and on a continuous basis. As new data become available, the graduate student at OSU

collects and compiles it and sends it to our resident economics staff for preparation for publication.

9. A total of 82 reports have been provided to OSU for this effort. The director of that project has indicated that TUSC service has been satisfactory to them. ARAC has been most helpful in supplying reports we did not have in our files in record short time.

10. We do provide such service to the Aviation Program on an ad hoc basis. Currently there are some problems which we are attempting to help resolve.

11. We have established, and maintain close working arrangements with the Kiamichi Economic Development District of Oklahoma, the Southern Oklahoma Development Association, and personnel involved at the state level in the coordination of these programs. Such arrangements are proving beneficial to all parties involved.

Technology Use Studies Center
Southeastern State College
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Area Code 405 --- WA 4 - 5412

29 May 1967

NASA Representative
National Aeronautics and Space
Administration
Post Office Box 5700
Bethesda, Maryland

Dear Sir:

Enclosed please find two (2) revised copies of
our Quarterly Status Report No. 8.

Please destroy those sent to you previously.

Sincerely,


Lee B. Zink *gt*
Director

LBZ:gt

Enclosures (2)