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THE ROLE OF SMALL BUSINESS IN FEDERAL GOVERNMENT R&D CONTRACTING: THE MSC EXPERIENCE

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PREFACE

This study was undertaken under the Resident Research Fellowship Program cosponsored by the National Aeronautics and Space Administration, Manned Spacecraft Center, and the University of Oklahoma, Department of Political Science. This Program has been designed to provide graduate students with the opportunity to conduct management research within an R&D-oriented organization.

The author, Miss Carol S. Mollison, was a graduate student registered at the University of Oklahoma during the time she conducted research at the Manned Spacecraft Center. Her completed report was submitted to the University toward the partial fulfillment of the degree requirements for a Master of Arts in Political Science.

Richard E. Stephens
Management Research Center

"The importance of small business to the economic structure of the Nation and our free enterprise system cannot be overemphasized. We must continue to build a stronger economy and particularly, a stronger small business sector of our economy."

(The Honorable Joe L. Evins, Chairman, Select Committee on Small Business, House of Representatives, "A Report of the Subcommittee on Government Procurement"...to the House of Representatives, Eighty-Ninth Congress, Second Session.)

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The author accepts full responsibility for the interpretation and presentation of the material contained in this report. Although many people contributed valuable ideas and information to this work, and although it was written under the NASA Manned Spacecraft Center Research Program, this paper is in no way to be construed as reflecting official agency policy.

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THE ROLE OF SMALL BUSINESS IN FEDERAL GOVERNMENT

R&D CONTRACTING: THE MSC EXPERIENCE

By Carol S. Mollison
University of Oklahoma

INTRODUCTION

The severe depression of the 1930's created an evident need for corrective action in the U.S. economic system. With an estimated 16 million people unemployed, the Government continued to exercise a hands-off policy under the pretense of protecting the system. This philosophy changed under the weight of public sentiment in the election of 1932. The new era was introduced and prospered for the next 35 years.

Since 1933 the U.S. Government has been acting as an economic stabilizer and has created many tools to serve this purpose. These tools can be classified as fiscal policy and monetary policy, the former being of importance to this work because Government procurement is relative to the expenditure program.

Private business firms are among the primary recipients of Government expenditures. These expenditures are designed not only to secure the necessary supplies needed to sustain Government activities but also, through fiscal policy manipulation, to stabilize and balance the economy.

In 1953 the United States Congress became alarmed at the results of a congressional committee study showing that in the period 1950-53 the index of sales to the Government by small corporations fell 45 percent, and by large corporations rose 20 percent (refer to the Eighth Semi-Annual Report of the SBA, 1957). Statistics of this nature led the Eighty-Third Congress to recognize a need for action to mitigate the damages accruing to small business firms from the concentration of Government procurement with big business. Recognizing that the Government must utilize the entire economic resources of the United States and not just the facilities of large firms, Congress enacted the Small Business Act in 1958.

A remarkable feature of this period since the end of World War II has been the steady and pronounced upward trend in research and development (R&D) activities in the United States. In 1963 more than 3 percent

of our Gross National Product went into R&D, and the outlook indicates continued growth in this country's investment in these activities during the remainder of the 60's (according to Research and Development Contracting, 1963, by SBA). Thus, the quest for scientific and technical knowledge has itself taken on many of the appearances of a major American industry.

In the past 2 decades, R&D has been perhaps the fastest growing segment of Government expenditures. At present almost one-third of all funds spent by the Federal Government on contracts with private industry is in the R&D area (refer to Research and Development Contracting, 1963). While a significant part of the R&D work in this country is performed in Government laboratories and by colleges, universities, and non-profit organizations, the "lion's share"--about three-fourths--is performed by American industry. At the same time by far the largest portion of industrial R&D, about 60 percent, is financed by the Federal Government and the rest is underwritten with company funds (refer to Research and Development Contracting, 1963). Because of the nature and complexity of the R&D business, only the very large business firms have the financial, technical, and management resources necessary for undertaking such a project as Apollo. Yet one of the basic philosophies underlying Government contracting is that the small business firm be given as much opportunity as possible to compete for contract awards. In terms of Government procurement, a small business concern is one which, including its affiliates: is independently owned and operated; is not dominant in the field of operation in which it is bidding on Government contracts; and, in most cases, does not have more than 500 employees (refer to SBA Rules and Regulations, 1967, Revision 6, Section 121.3-8). The dilemma facing the National Aeronautics and Space Administration (NASA) is how to comply with this philosophy (as embodied in the charter of the Small Business Administration), and still insure that the requirements of its technical programs are fulfilled by a capable contractor.

As part of NASA, the Manned Spacecraft Center (MSC) has had to cope with this dilemma while developing procedures to insure adequate participation by small businesses.

This report analyzes the MSC procurement activities for implementing the NASA small business policy, with particular emphasis on R&D type procurements. An attempt is also made to highlight the problems of small business firms in obtaining a greater share of R&D Contracts from NASA MSC. At least two general approaches to the analysis are possible: (1) how well do small businesses fare in competition with large businesses for such awards; and (2) are small businesses made more effective in obtaining such awards as a result of MSC policy. This report tends to use the second type of approach although, in conjunction with information included on the subject of MSC R&D procurements, it may also suggest answers to the question in the first type of approach.

The material in this report includes: a brief résumé of congressional interests toward small business concerns, as well as specific legislation on the subject of Government procurement; the basic mission of NASA MSC, and a discussion of the MSC small business policies and procedures; an evaluation of the MSC Small Business Program from various viewpoints within the organization itself and also from the viewpoint of small business firms; an analysis of the characteristics of successful Small Business R&D contractors for MSC; and the case study analyses of a successful and an unsuccessful MSC small business contractor. Based upon all of this evidence, significant conclusions are then presented.

CONGRESSIONAL INTERESTS AND FEDERAL POLICY TOWARD SMALL BUSINESS

In 1940 Senate Resolution 298 (76th Congress, Second Session) was enacted, creating a special committee to "study the problems of American small business enterprises, to obtain all facts possible in relation thereto which would not only be of public interest, but would aid Congress in enacting remedial legislation..."

Generally, select committees are "non-legislative" committees created to meet some immediate special purpose; and they disband once the need is met. The Small Business Committees have, however, had a quite different history: The House Committee has been in continuous existence since 1941; but the Senate Committee, with the exception of a 13-month period in 1949-50, has existed since 1940. They have become perennial select committees (what many call "standing committees in all but name")--perhaps because their creation was preceded by considerable interest-group activity based on the premise that small business was a distinct interest with special needs. In effect, the Small Business Committees became lobbyist within their own Chambers of Congress for or against measures affecting small business. Even though the tangible benefits from the creation of the two committees might not be great to most small businessmen, the action was at least a Congressional gesture of concern and sympathy.

From the very beginning, both Committees agitated for a separate small business agency. When the Small Business Administration was first created in 1953, as a temporary agency, the Committees began to agitate for permanent status. Such status was finally achieved in 1958 through the Small Business Act.

The Small Business Act was originally enacted as Title II of the act of July 30, 1963, and was designated the "Small Business Act of 1953." The current text was enacted by Public Law 85-536, approved July 18, 1958

(72 Stat. 384). Section 1 of that act divorced the Small Business Act of 1953 from the act of July 30, 1953, and created it as a separate statute to be known as the Small Business Act. Through this statute, small business has been singled out by the Federal Government for special treatment*:

> It is the declared policy of the Congress that the Government should aid, counsel, assist, and protect, insofar as is possible, the interest of small-business concerns in order to preserve free competitive enterprise, to insure that a fair proportion of the total purchases and contracts or subcontracts for property and services for the Government (including but not limited to contracts or subcontracts for maintenance, repair, and construction) be placed with small-business enterprises, to insure that a fair proportion of the total sales of Government property be made to such enterprises, and to maintain and strengthen the overall economy of the Nation.

In order that the policies contained within the Act might be carried out, provision was also made for the creation of an agency called the Small Business Administration (SBA). This agency was to be under the general direction and supervision of the President but would not be affiliated with or be within any other agency or department of the Federal Government.

Within the framework of the Act the various responsibilities of the Administration included (among others) defining a "small firm" within the various industries, inventorying small business facilities, and insuring fair treatment for small business.

In 1958 the Congress amended the Small Business Administration legislation, thereby greatly increasing SBA responsibilities in the field of R&D. In writing a new R&D Section of the Act, the Congress stated in part**:

> Sec. 9(a) Research and development are major factors in the growth and progress of industry and the national economy. The expense of carrying on research and development programs is beyond the means of many small-business concerns, and such concerns are handicapped

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*72 Stat. 384 (1958), as amended, 75 Stat. 667 (1961), 15 U.S.C. 631(a) (Supp. 1963).

**72 Stat. 384 (1958), as amended, 75 Stat. 667 (1961), 15 U.S.C. 638(a) (Supp. 1963).

> in obtaining the benefits of research and development programs conducted at Government expense. These small-business concerns are thereby placed at a competitive disadvantage. This weakens the competitive free enterprise system and prevents the orderly development of the national economy. It is the policy of the Congress that assistance be given to small-business concerns to enable them to undertake and to obtain the benefits of research and development in order to maintain and strengthen the competitive free enterprise system and the national economy.

Thus the duties of the SBA concerning R&D type contracts became threefold. The SBA was to assist small business concerns: (1) in obtaining Government contracts for R&D; (2) in obtaining the benefits of research done at Government expense; and (3) by providing technical assistance. Therefore a Research and Development Division was established within the SBA.

The SBA recognized in 1958 that many procurement officers were apathetic to the program designed to aid small businesses in their Government procurement. The antipathy displayed towards the program by local and national procurement officers was generally a result of the difficulty in dealing with small firms, as opposed to the ease of dealing with larger firms. Because many small firms were not even aware of the Government procurement opportunities, these smaller firms were difficult to reach. By 1959 this problem had been somewhat alleviated, but many Government procurement officers still felt reluctant to seek out the small business sources. This reluctance resulted in the establishment of the Contract Assistance Program.

The program subsequently developed by the SBA to fulfill its responsibilities to small business was the Set-Aside Program; SBA representatives at the principal military and civilian agency procurement centers worked with small business specialists in reviewing proposed purchases to determine which of them should be set aside for exclusive award to small business. Those purchases found suitable for supply by small business, if jointly agreed to by the SBA and the purchasing agency, were earmarked and reserved exclusively for competitive award to small firms.

In 1961 concern, both with the concentration of Government procurement dollars in relatively few companies and with the use of negotiation by the Department of Defense (DOD), led the Senate Committee on Banking and Currency to suggest adding to the Small Business Act some provisions which would require the development of a small business subcontracting program. Such an amendment, including a 90-day planning and implementation deadline, was proposed to and endorsed by the Congress. This

amendment, which became Public Law 87-305, stated in part that it is the policy of the Government:

> To enable small business concerns to be considered fairly as subcontractors and suppliers to contractors performing work or rendering services as prime contractors or subcontractors under Government procurement contracts, and to insure that prime contractors and subcontractors having small business subcontracting programs will consult through the appropriate procurement agency with the administration when requested by the Administration.

NASA MSC SMALL BUSINESS POLICIES

Mission of NASA and NASA MSC

On July 29, 1958, President Eisenhower signed an act of Congress creating NASA. According to this act, the declared policy of the United States was that activities in space should be devoted to peaceful purposes for the benefit of all mankind. Congress further provided that aeronautical and space activities sponsored by the United States should be directed by this civilian agency. NASA, established on October 1, 1958, had the three following goals:

(1) To conduct the scientific exploration of space for the United States

(2) To begin the exploration of space and the solar system by man

(3) To apply space science and technology to the development of earth satellites for peaceful purposes to promote human welfare.

On November 5, 1958, the Space Task Group, later to become the Manned Spacecraft Center, was formally established to provide project management of the manned spacecraft program. Because of the increased emphasis on and the expanded scope of the manned space flight effort, MSC was formally established in November 1961.

MSC, one of 13 NASA field installations, has as its primary mission the development of spacecraft for manned space flight programs and the conduct of manned flight operations. The Center's mission embraces an engineering, development, and operations capability to support its projects and also to generate the knowledge required to advance the technology of space and manned space flight development. Its efforts focus on the conception and implementation of a program of applied R&D in the areas of space research, space physics, life systems, and test and evaluation.

Policies and Procedures

From its very inception, NASA had a mandate from the Congress, by statutes, to see that contracts were placed with small business concerns to the maximum extent practicable. Full cognizance of this obligation is demonstrated in the National Aeronautics and Space Act of 1958, Section 203(b) (5), which provides that:

> To the maximum extent practicable and consistent with the accomplishment of this act...contracts...shall be allocated by the administrator in a manner which will enable small business concerns to participate equitably and proportionately in the conduct of the work of the Administration.

The R&D process is certainly the most important phase of NASA MSC operations. MSC itself has little in-house R&D capability, but acts primarily as a test and evaluation facility for the spacecraft hardware. In the area of contracting for R&D, MSC policy is to award those contracts to organizations which have been determined, by responsible personnel, to have a high degree of competence in the specific branch of science and technology necessary for the successful completion of the work. Thus the location and use of the most technically competent and qualified R&D organizations is a major factor in NASA MSC operations.

NASA MSC, realizing that the ability of an organization is not necessarily determined by size, attempts to insure that all qualified organizations are informed of R&D requirements and given an opportunity to submit proposals. Since Congress has declared that it is in the national interest to expand the number of firms engaged in R&D work for NASA and to increase the participation in such work by competent small business firms, steps have been taken to implement these directives.

These directives of the Congress have been reiterated in the NASA Procurement Regulations (NPR); and, through various methods outlined in the NPR, NASA attempts to carry out the policies of the Small Business Act in spirit as well as in name. In July 1959, NASA established a formal small business program. The Director of Procurement was to be responsible for this program and was to designate a senior staff member as a small business advisor. In addition, each field installation, like MSC, was to have a small business specialist who would examine procurement transactions to determine suitability for small business participation. The other purposes of the MSC small business specialist were: (1) to provide a central point of contact to which small business concerns could direct their inquiries concerning participation in the NASA MSC procurement program; (2) to provide assistance to small business concerns in submitting bids or proposals, and in the performance of

contracts; and, (3) to establish and maintain coordination with the SBA, and institute any procedures which would help to attain effectively the desires of the Congress as set forth in the Small Business Act.

Within the spirit of the Small Business Act, MSC employs such methods to aid and encourage small business participation as:

(1) Maintaining a vendor source list on a current basis, and reviewing it frequently to insure that all those small business firms are included which have made an acceptable application to NASA MSC or which appear from other information to be qualified

(2) Acquiring description data, brochures, or other information concerning those small business firms which appear competent to perform R&D work in fields of NASA MSC interest--and furnishing such information to technical personnel

(3) Allowing, to the extent feasible, the maximum amount of time practicable for preparation and submission of bids and proposals

(4) Establishing, to the extent feasible, delivery schedules suitable for small business participation

(5) Providing to authorized SBA representatives, upon request, that information necessary to understand MSC's needs concerning R&D programs under consideration for specific future procurement actions

(6) Disseminating widely that information relating to MSC purchasing methods and practices

(7) Interchanging freely ideas and information with appropriate SBA levels in regard to programs for limiting suitable procurements to small business concerns

(8) Referring every purchase request applicable to small business ($5000 and above) to the SBA to solicit qualified sources

(9) Sending a synopsis of procurements in excess of $10 000 to the Department of Commerce which then advertises the proposed procurement in an attempt to reach all interested bidders

(10) Publicizing proposed unclassified R&D procurements which may result in an award of $100 000 or more.

Assistance in prime contracting is, however, only one part of the MSC small business program. When the Small Business Act was amended in 1961 by Public Law 87-305, a Subcontracting Program was established.

The MSC Small Business Subcontracting Program requires that its prime contractors assume an affirmative obligation with respect to subcontracting with small business firms; non-compliance with these contractual obligations may result in termination of the contract, either in whole or in part, for default. In those contracts ranging from $5000 to $500 000, the contractor, through a "utilization of small business concerns" clause within his contract, undertakes the obligation of accomplishing the maximum amount of small business subcontracting consistent with the efficient performance of the contract. In those contracts which may exceed $500 000, the contractor is required to undertake a number of specific responsibilities designed to insure that small business concerns are considered fairly in the subcontracting role, and to impose similar responsibilities on its major subcontractors. These large contractors must maintain a small business program and appoint an officer to maintain liaison on that program with the MSC small business specialist.

THE NASA MSC SMALL BUSINESS PROGRAM: THE MSC VIEWPOINT

The four MSC viewpoints in this report section represent the Small Business and Industry Assistance personnel, the Contracting Officers, the Engineering and Development personnel, and the Small Business Administration Representatives. These basic viewpoints result from information, included herein, acquired primarily through personal interviews. On the bases of the various viewpoints within MSC, the success and the problems of the MSC Small Business Program are discussed and evaluated.

Small Business and Industry Assistance

The opinion at this level is that the Small Business Program is fairly successful, but not as effective as possible. Because small companies, or even a combination of small companies, are not able to handle large contracts for the development of space vehicles--a task requiring experienced engineering staffs, extensive facilities, and substantial capital--small companies find they are most able to participate through subcontracts. The problem in this area is that of no direct control, as such, over the prime contractors. The large contractors must send financial reports of subcontracting activities to the SBA, so there is a somewhat indirect threat for compliance; for the SBA may, on the next submitted bid, make a poor recommendation concerning prior lack of subcontracting. Such a recommendation will be considered as a factor in making awards. Under these circumstances, the large contractors will tend to adhere fairly closely to the small business subcontracting policy.

In trying to implement the stated policy in the area of prime contracting, the Small Business and Industry Assistance personnel find they are confronted by numerous problems. Paramount among these is a seeming lack of interest on the part of many small business firms. Where sources have been established, small businesses are given every opportunity to participate. Although the very nature of the advanced state of the art in MSC requirements does not preclude the participation of small businesses in bidding, they are reluctant to offer proposals. Therefore, the overall response is often only fair.

Another problem in prime contracting concerns the use of the Vendor Source List maintained by the Small Business and Industry Assistance Office. On occasion this bidders' list will contain so many names for an item that soliciting and examining bids from every potential source is not practicable. Consequently, the office may send invitations to only part of the list each time a purchase is made. The names are changed at subsequent proposal invitations until every listed firm is given an opportunity to bid. Problems do result, however, from the fact that the purchase requests originate from the individual technical branches with little coordination of suggested companies. Therefore, relatively few companies may be solicited quite often, while others may receive a request for proposal (RFP) only infrequently. Furthermore, the belief exists that when a suggested list of suppliers is included on the purchase request a definite tendency develops to use the same firms repeatedly, thus limiting the possibility of locating additional competent sources.

Other problems arise from the implementation of the Small Business Set-Aside Program. In accordance with the NASA Procurement Regulations, when the Small Business and Industry Assistance Office receives any RFP in an amount over $2500 the RFP is reviewed by the Small Business Specialist. He determines, before proposals are issued, the suitability of small business firms to participate. After checking the Source List to see how many small and large business firms list themselves as having the ability to fulfill the requirements, the specialist has the prerogative to designate the procurement action a Small Business Set-Aside. Problems can then arise from two different sectors. The first of these problems could come from the purchasing (customer) division or branch since it may have given a list of recommended sources or preferences on the purchase request, some of which may have been large business firms; these large business firms will not receive an RFP if the procurement is made a Small Business Set-Aside. The second problem is the possibility of a complete lack of effort and interest on the part of small businesses, resulting in absolutely no replies to the RFP. The subsequent loss of time not only is important in itself, but also aids in the rise of ill-feelings toward the Small Business Set-Aside Program.

Although the personnel of the Small Business and Industry Assistance Office feel that small business can play a role in the MSC procurement program, they realize that unless the small businessman is helped he will not have much of a chance. From their viewpoint the Small Business Program has been relatively successful but, due to problems (presented in this report section), it has not been as effective as possible.

The Contracting Officer

Those Contracting Officers interviewed felt that the Small Business Program, as a whole, had been effective even though it did create problems for them.

As might be expected, some of the strongest impressions concerned the Small Business Set-Aside Program. Among those interviewed, some felt that because the Contracting Officer is responsible for the contract he should have a greater role in determining whether or not a procurement action should be made a Small Business Set-Aside. At times, even though the Vendor Source List indicates a sufficient number of small business firms capable of supplying a product to warrant making it a Set-Aside, the complexity of the system as a whole may be beyond the capability of many or all of the small business firms. Thus, none of the firms solicited will answer the RFP. Then, after 2 to 4 weeks of lost time, the bid is re-opened for competitive bidding. This loss of time is an important and costly element.

This problem of receiving no proposals from the Small Business Set-Aside RFP has become more and more frequent in recent years, and a suggested remedy was a greater breakdown of capabilities in the Vendor Source List. One Contracting Officer also stated that, due to Set-Asides, he often has the feeling that the company will be unable to complete the job successfully, but he must give that firm the award anyway. (This is an extremely harmful attitude, because it can only be detrimental to the relationship between the Contracting Officer and the firm.)

Certain other problems arise within the area of prime contracting. These generally stem from small businesses making an over-optimistic judgment of their capabilities within two areas. The first is that of finances: Part way through the completion of a contract a small company may find that the cost of fulfilling the contract is more than had been estimated, either because of technical problems or of miscalculations in the original proposal. Then the small business firm which had little extra capital when beginning the project is confronted with the very real danger of being unable to supply the finished product and, in that case, stands to lose all. The second area of difficulty is that of the quality required: A small business firm may have on its staff an engineer from one of the larger corporations who knows the techniques of the

large corporations, and who writes up an outstanding brief and proposal--regardless of whether or not the small business firm has the technical resources or facilities to produce the finished product according to the quality specifications.

Only one problem concerned with subcontracting seems worthy of comment, and this problem is also related to the area of small business prime contracting. If a small business firm does not have the facilities to produce the quality required in the finished product, it may then subcontract components of the product to other business. The resultant dangers are twofold: First, the diverse parts may be of varying quality, thus making the quality of the finished product below the required standard. Secondly, maintenance at a later date may present a problem. In relation to the second danger, small business firms seem to exhibit a greater tendency to maintain operation of the product only until the warranty expires and their legal responsibilities end. (This hazard may be a direct reflection of a financial inability of the small business to absorb the cost of complete repair or replacement of the product.) Those Contracting Officers interviewed argued that this danger could be avoided with large business concerns, most of whom would spend the money necessary to repair the product even if at their own cost.

Recognizing their responsibility, the Contracting Officers further stated that they use small business firms whenever possible, make a point of doing so, and in this respect almost show favoritism toward small business concerns. Realizing their obligation to use small business concerns whenever possible in a case where both a large and small firm were judged competent for a particular contract, the Contracting Officer felt that he must award the contract to the small business firm. This tendency is recognized by the Contracting Officers interviewed, however. From cases such as this, the variety of pressures surrounding the contract award process can be appreciated.

Except for the viewpoint expressed in the preceding paragraph, the views of the engineering and technical personnel interviewed coincided with those of the Contracting Officers. Nothing was new or significantly different in their views.

Small Business Administration Representative

Locally, the SBA participates with MSC in a cooperative effort to locate qualified small business suppliers. Until approximately 1 year ago the SBA was active in the Small Business Set-Aside Program, but at the present time the SBA representative at MSC serves primarily as an auditor of procurement awards for the SBA. There is presently much activity in congressional committees to change this passive role into one

much more active, not as a reflection of the job being done by the Small Business Specialist but as a means of strengthening the Program as a whole. If the proposed legislation now in committee is adopted, the Small Business Specialist and the SBA Representative will be equal in their status, thus making the viewpoint of the SBA Representative relevant to this report section.

The views expressed were short and to the point: First, there are not sufficient Set-Asides for small business. If two capable and qualified sources exist, then this is competition and the action should be made a Set-Aside. Second, the SBA Subcontracting Program is not as effective as possible because the program has "no real teeth" with which to assure compliance. Third, the large R&D contracts should be broken down into component parts which can be supplied by small business firms.

The final thought of the SBA Representative is that, even though the Program itself is too passive, the way in which it is administered by MSC is good. The Procurement Regulations are meticulously observed by the MSC Small Business Specialist and his staff, all of whom are conscientious and do the best job possible with the apparatus provided.

The Small Business Administration R&D Specialist feels that, here at MSC, the key to establishing a good R&D Small Business Program appears to lie in winning the confidence of the technical and engineering people and in showing them that the SBA offers a service helpful to their programs. He also feels that not enough effort had been spent in explaining the program to MSC technical personnel, without whose support the R&D Small Business Program could never be a complete success.

WORKING WITH NASA MSC: THE VIEWPOINT OF SMALL BUSINESS FIRMS

The source of the information in this report section was a questionnaire which was mailed to a sampling of 96 small business firms chosen at random from the MSC Vendor Source List (see Appendix A). The purpose of the questionnaire was to learn the opinion of small business concerning: (1) their evaluation of the Small Business Program, (2) their preference as to their specific role in R&D contracting, and (3) their respective problems in R&D contracting. A total of 34 questionnaires (35 percent of the total sample) have been returned to MSC at this time. The trends which emerged are of some interest and significance, and the questionnaire results are analysed in the following material.

Question 9 of the prepared questionnaire asked of the small business firms: "From your point of view how successful has the Small Business Contracting Program been?" The answers ranged from "highly successful" to "completely ineffective." Only 20 percent of the answering firms felt that the Contracting Program had been highly successful, while 27 percent considered it moderately successful. The remaining 53 percent felt that the Program enjoyed little or no success. In the reasoning for their answers, this latter group showed a definite trend of explaining that their contracts had resulted from direct contacts with the technical people involved, rather than from the Program or through assistance from the Small Business Specialist.

Question 12 asked: "Do you think the Small Business Set-Aside Program has been successful?" Of the answers, 39 percent were affirmative; 61 percent, negative. The important trend emerging in the explanations is that the Program has been helpful in increasing participation of small business firms; but, due to the small number of Set-Asides, on the whole it has not been particularly helpful in increasing the total proportion of MSC business going to small business concerns.

Question 13 was again one of degree: "...how successful has the Small Business Subcontracting Program been?" The trend discernible in the affirmative ("highly successful") 33 percent of the answers is that this program tends to force large business firms to look for small but competent developing organizations rather than proceeding to build their own company organization further. Nine percent felt the program had been somewhat successful. The remaining 58 percent did not feel the program had experienced any significant degree of success. This third group tended to feel that any success had come strictly from the competence of small business and its ability to do the job less expensively, and perhaps more quickly, than the large firm--thus making the program successful, not through active planning by the prime contractor or the SBA, but through economic convenience.

The purpose of question 17 was to obtain the small business opinion of the overall procurement picture ("How successful do you feel the Small Business Program has been as a whole?"). As might be expected, the distribution of the answers tended to fall more evenly. Three possible categories indicating high, moderate, or little (or no) success--were listed for response. Of those who replied, 30 percent felt that the program had had considerable success and that, if the program had not existed, the large business concerns would probably have dominated R&D contracting. According to 35 percent, the Program had achieved a moderate degree of success. The remaining 35 percent, who felt the Program had little or no success, reiterated that any degree of success was due entirely to the competency of small business firms themselves.

The second set of questions dealt with the subject of subcontracting. Groups expressed the idea that the major role to be played by small business firms was one of subcontracting. The purpose of the questions was to investigate the following statement (refer to material by Albert N. Schrieber) and discover the opinion of small business firms:

> Small businessmen have indicated a preference to participate in government procurement programs as subcontractors to other prime contractors, rather than as prime contractors themselves,...backed up by...business receipts...

Question 14 asked: "Have you done subcontracting for a NASA MSC prime contractor and was it a satisfactory experience?" Of those small business firms answering, 45 percent had done NASA MSC contracting and 56 percent of these found the experience satisfactory. To the next question ("Do you find it easier for your company to secure subcontracting awards than prime contracts?"), in 64 percent of the cases the answer was "No." The trend of explanation here was that the MSC prime contractors did not adhere strictly to the MSC Procurement directives and tended to do most of their R&D work in house. Twenty-two percent of the firms felt that no difference existed in the relative difficulty or ease in securing either prime contracts or subcontracts. The remaining 14 percent felt it was easier for them to secure subcontracts than an actual prime contract.

The next question pertaining to the subject of subcontracting was number 16: "Do you prefer doing subcontracting work over that of prime contracting?" Only 16 percent indicated a distinct preference for subcontracting. Their explanations revealed two basic reasons: most of the "primes" were beyond their capabilities, as small firms, in finances, facilities, and personnel; and subcontracts were generally easier, due to less red tape. Fifty-eight percent definitely preferred prime contracting, and in their explanations several trends emerged. The strongest trend was the preference of having direct recourse (in prime contracting) to the MSC Contracting Officer, and the advantage of this arrangement is obvious in questions related to definitions and specifications. Another expressed opinion was that many "primes" have a tendency to tighten the specifications on the subcontractors in order to protect themselves and therefore make it more difficult for the subcontractors to fulfill the obligations successfully. Two other trends of explanation which emerged in lesser strength were that: (1) the endless chain of approvals in a multilayered management tended to stifle originality, and (2) there was less likelihood of follow-up business. Twenty-six percent of the firms indicated that they had no preference between prime contracts and subcontracts but were simply glad to receive the business regardless of the source.

The third set of questions dealt with the problems encountered by small business firms in competing for MSC contracts and in reaching a successful completion of the work. Specifically, question 10 was concerned with the major problems in competing for an award, and several strong trends became evident. Over 50 percent of the firms felt that one of the major problems, a lack of personal contact with the customer, resulted in two significant ramifications. One was that the competency, capabilities, and particular specialities of most small business firms were then unknown to the MSC technical staff and the MSC small business assistance staff. As the other ramification, therefore, small business lacked knowledge concerning the problems, needs, and requirements of the technical assistance required by NASA MSC. The second trend in problems of small business firms was that these were, when in competition with large business firms, at a disadvantage due to their limited financial status. The larger organizations, depending upon their degree of interest in a contract, might submit a bid price which included no profit-taking or even a loss--simply to insure receiving the award. This bidding strategy was one which small business firms were unable to employ because of their limited financial resources.

Question 11 was concerned with those problems which small business firms encountered after receiving MSC awards. The most dominant trend expressed was that of improved compensation. These firms felt that they were forced into fixed price contracts which yielded poor financial returns; for the fact that their bid price was usually considered too high and was pounded down, in negotiation but not in the work statement itself, would lead to overruns the company would have to absorb. This eventuality could be disastrous because of the relative financial weakness of most small firms. The other basic problems were an understanding of the technical definitions and a successful adherence to the tight specifications within the allowable time.

ANALYSIS OF SMALL BUSINESS R&D AWARDS

Although no direct attempt has been made here to measure the relative success of small businesses in competition with large businesses for MSC R&D awards, a profile analysis of the characteristics of successful small businesses and of the circumstances in which they have been successful in winning such awards would seem to be a usable, if indirect, mode for assessing the general effectiveness of MSC small business policy.

Therefore an attempt was made to sort out all the R&D contracts let to small businesses during the calendar year of 1966 (see appendix B). A detailed cross-section analysis of the characteristics of these firms was then undertaken. Those characteristics found common to the sample

are enumerated here with an interpretation of their probable significance. The results of this analysis are assumed to be typical of MSC procurements in this area during other time periods.

The study sample itself (from the Procurement and Contracts Division: Report on Status of Contracts and Grants E1, as of February 28, 1967) includes all R&D contracts in excess of $10 000 awarded to small business from January 1, 1966, through December 31, 1966. Those contracts negotiated with small business under negotiation authority 11 (procurement placement codes 03 and 04) and negotiation authority 17 (code 38--Small Business Set-Asides) were considered to be R&D type contracts.

Analysis of Contract Negotiations and Types of Awards

The following considerations seem to be suggestive of the circumstances in which small businesses are successful in winning MSC R&D awards.

Small Business Set-Asides.- Of 46 total awards in the study sample, nine (19.5 percent)--with a total value of $594 561--went to small business as a result of Set-Asides. These awards were 14 percent of the total value amount of all awards made during this time period.

Types of contracts.- The large majority (89.1 percent of the awards; 62 percent of the value of all awards) of the contracts in the study sample were fixed-price contracts. However, the usual justification for the use of cost-plus-fixed-fee (CPFF) contracts for performance of R&D work seems not to have been applied when the awards were made to a small business. If this is the case in all MSC small business R&D procurements, then considerable significance may be attached to the finding; for it would mean that small businesses are assuming a greater relative risk than large companies in dealing with MSC. (The subject is discussed further in subsequent sections of this report.)

Another fact which seems significant is that, of the remaining five contracts (three, cost-plus-fixed-fee; two, cost-plus-incentive fee), all were awarded to small businesses with prior Government R&D contracting experience; and four of these five businesses had prior R&D contracting experience with MSC. The five contracts amounted to 38 percent of the value of all contracts awarded to small business.

Vendor Source List.- Of the 52 companies in the study sample, 34 (81 percent) are listed in the MSC Vendor Source List as of April 1, 1967 (maintained in the Small Business and Industry Assistance Office). The other eight successful firms, none of which was sole source, requested

an RFP on their own initiative, perhaps in response to the procurement synopsis in the U.S. Department of Commerce Daily. Those companies not listed on the Vendor Source List received 18 percent of the value of all awards.

Competitive and noncompetitive procurements.- Of the 56 contracts, 35 (76 percent) were negotiated competitively; 11 (24 percent) were not. Only a slight relationship seems to exist between the value of the contracts and whether they were competitively negotiated. Of the first five most valued awards, four were noncompetitive; the other noncompetitive awards ranged from tenth to forty-sixth in value of award. Noncompetitive procurements accounted for 51 percent of the total value of all awards made. Conversely, a significant relationship does seem to exist between noncompetitive procurements and prior business with MSC: of the 10 companies, five (50 percent) had prior MSC experience; and these five companies received 90 percent of the total value of all noncompetitive awards. Possible explanations for this relationship would be follow-up business and a technical compatibility with already existing MSC equipment.

Relative responsiveness of large and small business.- In the 23 cases in the study in which both large and small businesses were solicited for proposals, small businesses were more responsive (measured as number of responses per number of firms solicited) to MSC RFP's than large businesses in 17 of the cases (75 percent of total cases). Large businesses were more responsive in only six cases. Overall, the average percentage responsiveness of small businesses was 40.4 percent, and, of large businesses, 24.3 percent. The difference in average responsiveness was primarily attributable to five contracts on which large businesses were completely nonresponsive.

In figures 1 and 2 an attempt was made to relate responsiveness to value of awards. In general, in terms of responsiveness to RFP's, both large and small businesses tend to be more responsive to the higher valued contracts and less responsive to the lower valued awards. However, this relationship is not a strong one. Perhaps a greater significance than value of contract is the specific nature of the proposed procurements. Persons familiar with the technical nature of the items procured in the study sample may find a much more meaningful relationship in the response patterns of small and large businesses to MSC proposed procurements.

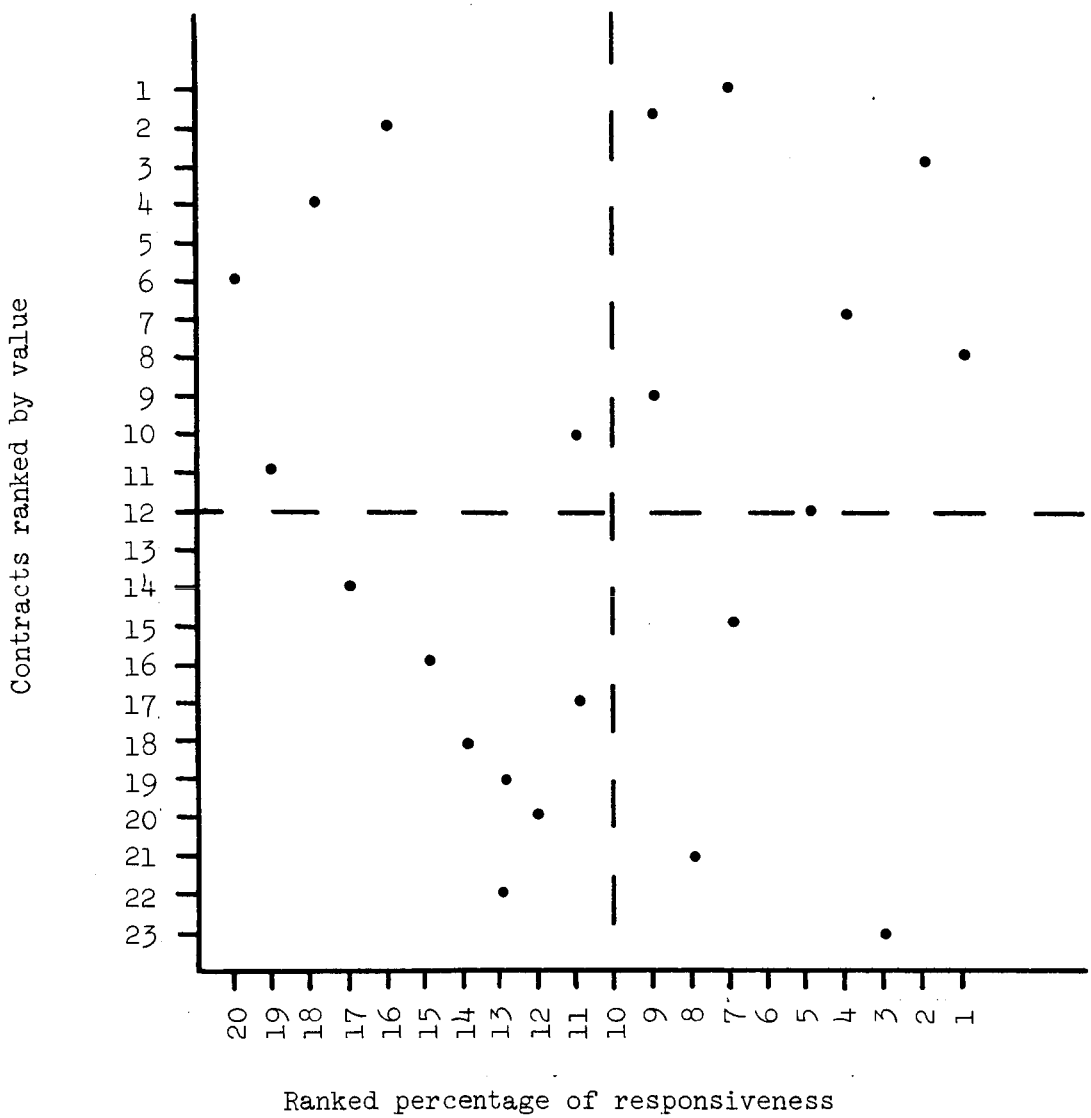

Figure 1.- Responsiveness of large and small businesses relative to value of contracts.

Note: The cases studied were ranked by value and by percentage of total responsiveness of large and small businesses with the number one being the greatest in value. Each point thus represents a particular contract.

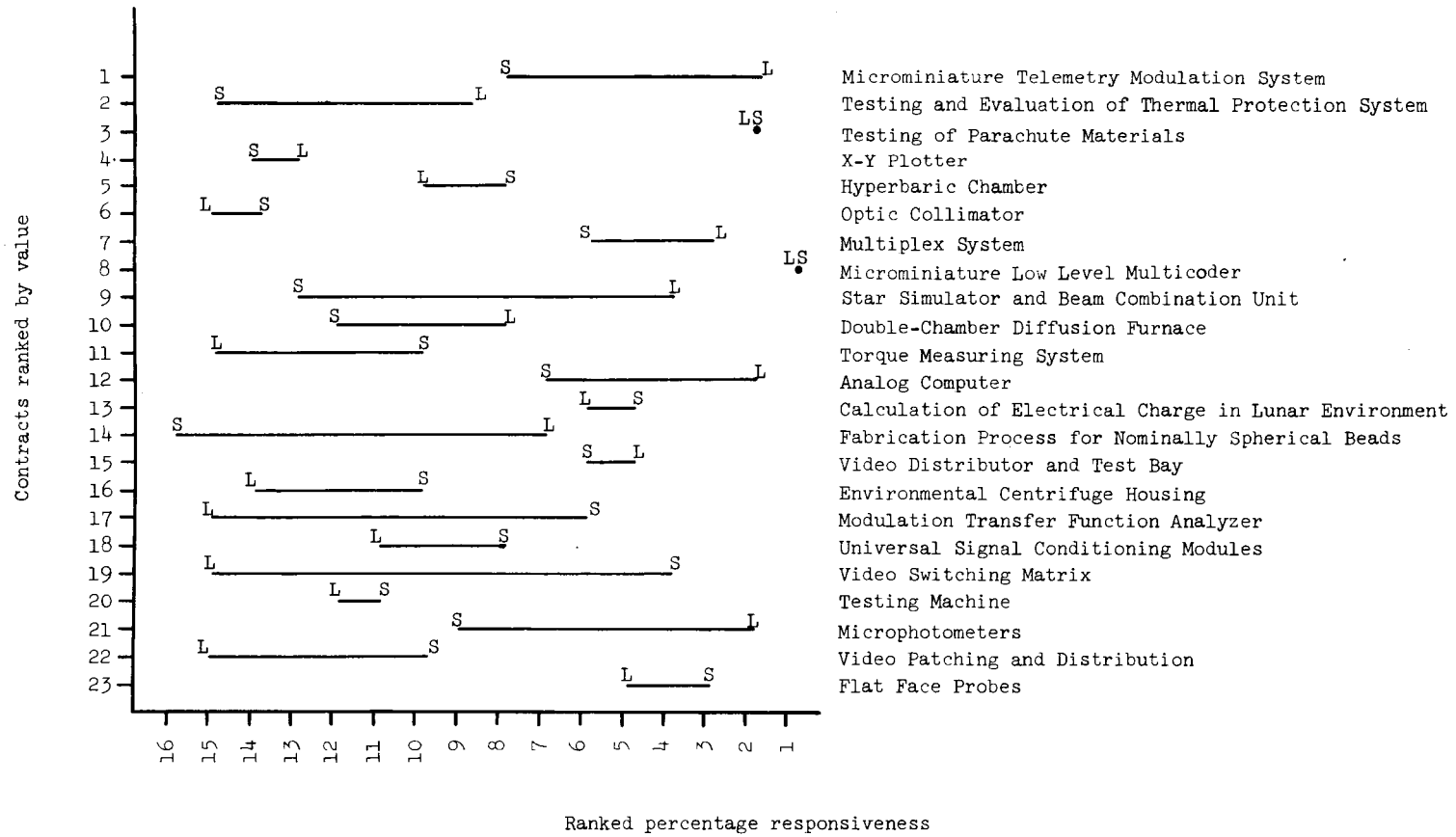

Figure 2.- Relative responsiveness of large and small business in relation to value of contracts.

Note: The value of contracts are ranked such that number one is greatest and each point or line represents one contract. The percentage responsiveness of small and large businesses are ranked within each particular class. The horizontal lines indicate divergent degrees of interest in each contract by large and small businesses (as measured by degree of responsiveness within each class). Note the varied degree of relative interest in particular contacts. When measured in this manner large and small businesses, as groups, indicate varied patterns of interest in the contracts studied. It is significant that the divergent degrees of interest in the contracts are not arranged systematically with respect to their value.

Analysis of Some Characteristics of Successful MSC Small Business R&D Contractors

The available information from which the data in this section were taken is somewhat less complete and less accurate than that already presented. In particular, the data on personnel and net worth of the contractors were not complete and, in some cases, not current. In the case of those companies which may have experienced rapid growth the figures may be misleading. The general results, however, seem probably to have some validity.

Length of time in business.- As could be anticipated, the firms in the study sample were relatively young. The median age of the 33 companies for which data were available was 8 years, and the average age of all the companies was 12 years. Of these companies, 20 (61 percent) were 10 years old or less; 27 (82 percent) were less than 20 years old; and only one of the companies was over 30 years old.

Number of employees.- Of the 34 firms for which data were available, 22 (65 percent) had less than 100 employees; 30 (88 percent), less than 200 employees; and only four (12 percent), more than 200 employees. The average number of employees computed for all companies was 98.

Previous business with MSC.- Eleven (26 percent) of the 42 companies in the study sample had had prior MSC contracts at the time they were awarded the contracts under consideration within this report. The contracts in the study sample which were awarded to these companies have a total value of $2 161 142 (61 percent of the total value of awards). Thus, as a group, the firms having had previous contracting experience with MSC were apparently no more successful in winning awards than the others. But an analysis of the ranked value of prior awards in relation to those in the study sample revealed a positive relationship between past experience and current success of particular companies when success was measured in terms of the value of awards (fig. 3).

Net worth of companies and relation to size of awards.- Data were available concerning the net worth of 31 of the study companies, although the recency of the figures varied greatly. Therefore, the present analysis proceeds on the assumption that, while the net worth of the companies may have changed in time, the relative rankings of the campanies in terms of their net worth will have remained substantially stable.

The net worth of the 31 companies ranges from $10 000 to $4 559 400, with a median value of $350 000 and an average of $562 464. An attempt was made to relate the value of MSC contract awards to the net worth of the successful small business firm. A general, positive relationship

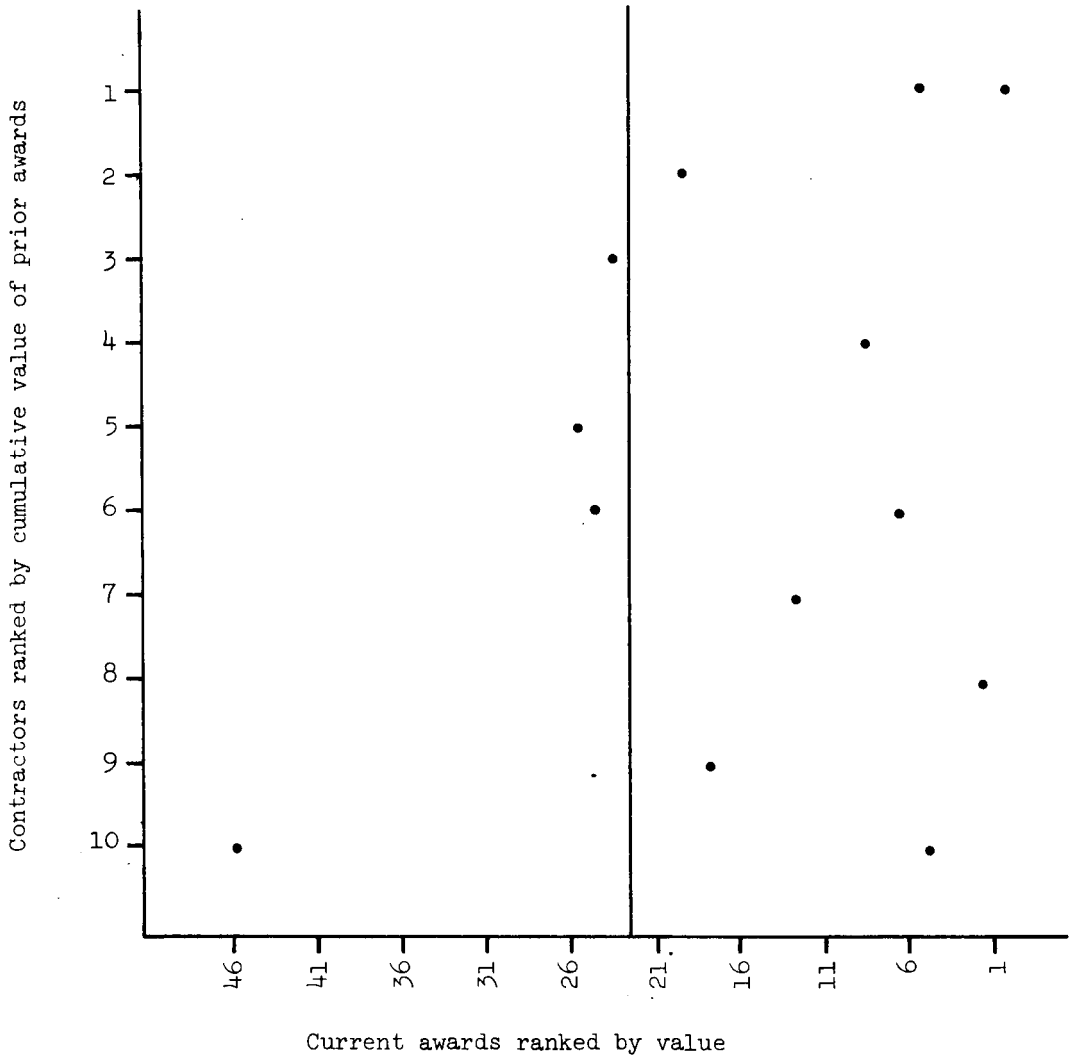

Figure 3.- Prior experience of small businesses in relation to success in winning current awards.

Note: Ten of the 11 companies having had prior contracts with MSC were ranked according to the cumulative value of prior awards (three of these companies had two active contracts). Such success and experience would seem to favor them for current awards, and the assumption would appear to be justified by the above figure. Of the six companies most successful in the past, all succeed in ranking in the first 11 companies in terms of current awards. Nine of the most successful in the past ranked in the first 20 companies in terms of current awards. (The vertical line sets off the first 23 companies ranked by value of current awards.)

seems to exist between the size of awards and the size of small businesses winning them when the latter is measured in terms of net worth (see fig. 4).

For each of the 31 companies the ratios of the value of current awards to net worth were computed. These ratios were relatively high in a few cases--that is, the value of current MSC contracts were greater than or almost equal to the actual net worth of the company. An accurate ratio of this type would provide some measure of the willingness of small businesses to accept risk on R&D work under fixed-cost contracts; but, unfortunately, the ratios are of comparatively little use due to the age of the net worth figures. Significantly, however, 17 (55 percent) of the 31 firms have a net worth less than five times the value of the contract awards.

Some Implications of the Study Sample Results

In this report section are suggested some possible generalizations which can be drawn from the data presented.

Best approach for small businesses desiring MSC R&D contracts.- Undoubtedly, the best approach for would-be MSC contractors is to be listed on the MSC Vendor Source List. For a small business to gain such an award on its own initiative (by requesting a specific RFP) is not impossible, but past results indicate a firm is more likely to be successful in winning a competitive contract if on the Vendor Source List. Unsolicited proposals and sole source procurements are not insignificant means through which a small company may receive an R&D award, but they are less significant than competitive procurements initiated by MSC. Although a company may possibly receive a sole source contract when not listed in the source book, receiving such an award is less likely for an unlisted than a listed company.

Repeat business.- If the sample studied is representative of MSC R&D procurements from small businesses, then the winning of an MSC contract does not seem to be a good indicator of success in future award competition. Evidently, however, winning an R&D contract improves a company's chances of being selected as a sole source contractor for future procurements.

Large and small businesses in direct competition.- The study suggests that large and small businesses, as integral groups, find specific proposed procurements more or less enticing, as indicated by the responsiveness of each group to the RFP. This tendency may have the effect of favoring small businesses in some cases because they are slightly more responsive than large firms; however, this relationship should not be overemphasized since the pattern is not particularly marked (fig. 2).

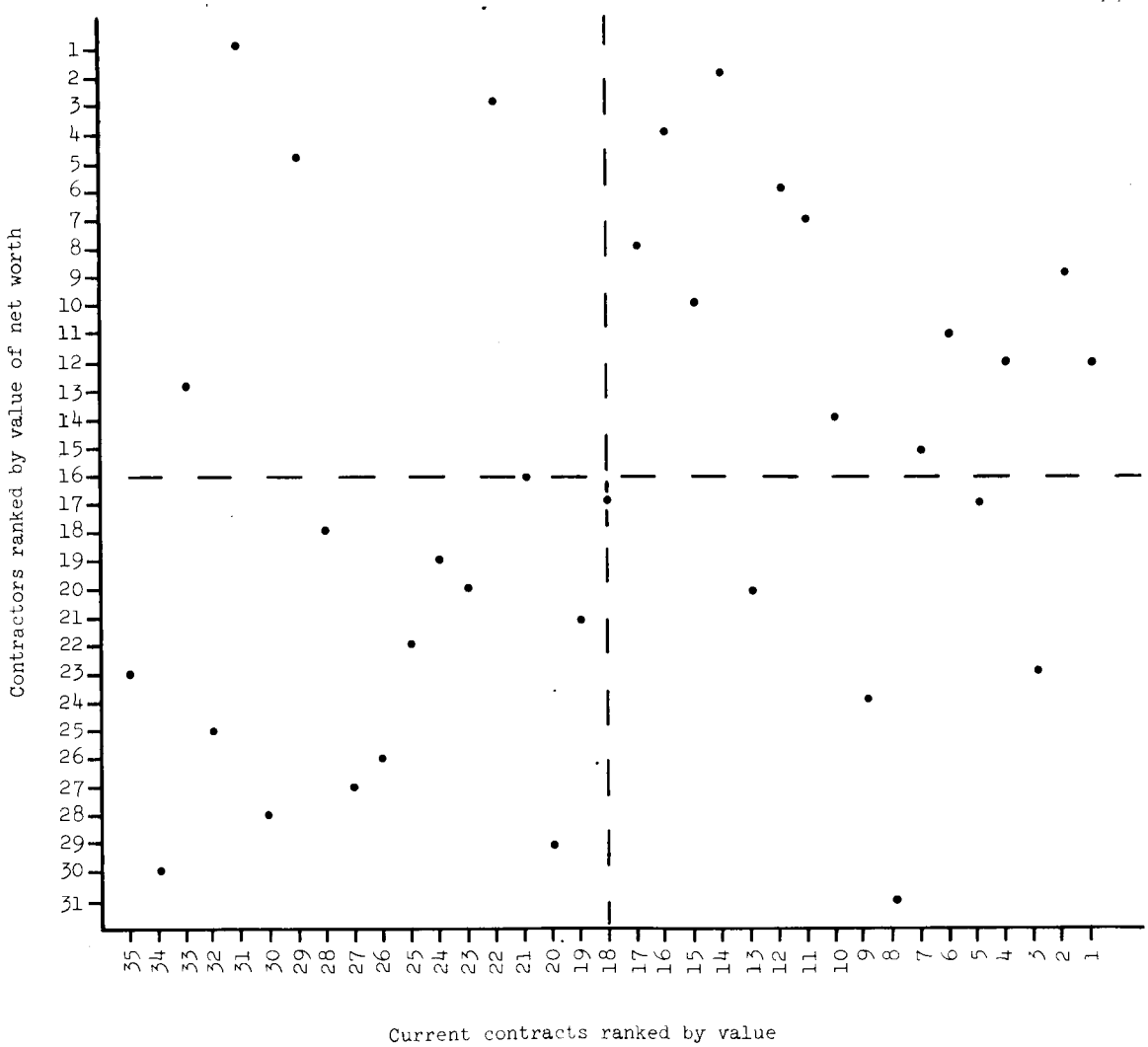

Figure 4.- Value of current contracts in relation to net worth of the contractor.

Note: The 31 small businesses for which data were available were ranked according to net worth and value of contract awards in the study; a positive relationship appears to exist. The value of the net assets of a company is probably a fair indicator of its ability to undertake projects of a given scope.

Willingness to assume risks.- The use of fixed-price contracts, when possible, is advantageous for the Government. Such contracts place solely upon the contractor the risk implicit in the designated R&D. R&D work undertaken on a fixed-price basis is, in most instances, quite hazardous. To a greater extent than in any other type of procurement a contractor is faced with these risks: (1) impossibility of performance, (2) miscalculation of cost and time, and (3) likelihood of dispute concerning the proper interpretation of the specifications. Therefore, the fact should be recognized that the use of such contracts may contradict the general small business policy by placing proportionately greater risks upon small business/small contracts than upon large business/large contracts.

This case may conceivably apply to many contracts in the current study. Observation indicates that perhaps small businesses show a greater willingness than large businesses to accept high risks. Emphasis should be placed upon the fact that no good test of this hypothesis is possible with the current information.

If this hypothesis is accurate, however, two implications should be noted. First, allowing small businesses to assume such risks is inconsistent with the stated small business policy. Second, if technically competent small businesses are willing to assume such risks, it will be in the best interest of NASA and the Government to place with them a larger proportion of R&D contracts.

General evaluation of the effectiveness of MSC Small Business Policy.- Difficulty arises in assessing the importance of MSC small business activities in the success of the companies studied, because this assessment would require conjecture about their relative success without such assistance. It is probably significant that, with nine exceptions, the R&D contracts won by these companies did not result from a Small Business Set-Aside. Moreover, MSC probably benefitted from the fact that many of those small business firms which have been successful were technically competent to rival large businesses. (This competency is perhaps a tribute to their own particular skills rather than to the direct encouragement of MSC.)

On the other hand, the Small Business Office provides minor firms with an excellent entrée to the competitive circle. Because of their limited resources, small businesses would be unlikely to gain this access in any other way. In general, MSC affords positive encouragement to small businesses by providing an opportunity for them to demonstrate their skills and to compete for the work required. MSC is, however, unable to discriminate in favor of small businesses in the awarding of R&D type contracts. Because of the Center's mission and the technical requirements, nondiscrimination is the only possible policy; for the highest possible quality of hardware is mandatory, regardless of the size of the business concern.

Concluding changes which could be made to strengthen the program and its overall effectiveness are presented in the final section of this report.

SUCCESS AND FAILURE IN MSC CONTRACTING: A CASE STUDY ANALYSIS

In the early part of 1963 NASA MSC awarded respective R&D contracts to two small business firms. One of these firms completed the contract successfully, while the other did not. The following case study analysis is an attempt to ascertain the causes for the success and the failure.

Case I: The Successful Firm

At the time the RFP's were issued, company I had been in its present business for 3 years, employed 30 persons, and had a net worth of $200 000. Its previous experience in prime contracting had been with the United States Air Force in the area of medical instrumentation for use in space flight.

In November of 1962 NASA MSC issued five separate RFP's for the development of advanced physiological instrumentation to monitor the astronauts in the Gemini Manned Spaceflight Program. Company I was one of 50 bidders, among whom were several industry giants, on each of the procurements. NASA's evaluation board selected this company as ranking first technically on all five of the procurements. Because of this unusual circumstance, a second evaluation team was convened; but again these technical proposals by company I were rated best. Four of the five items required were then incorporated into one CPFF contract: NAS9-1150, awarded in early 1963, in the amount of $76 828. The fifth item was awarded on a separate CPFF contract: NAS9-1151, in the amount of $23 317. The company proceeded with development of the units and delivered 10 prototypes of each unit in November and December of 1963 for evaluation. Tests conducted verified the superiority of the units which not only met all specifications but exceeded expectations.

Case II: The Unsuccessful Firm

At the time of the issuance of the RFP under discussion, company II had been in its present business for 1 year, employed 20 persons, and had a net worth of $100 000.

On April 16, 1963, a purchase request for two solid-state telemetry transmitters was sent to the Small Business Specialist for coordination. Because of urgency, the request was not synopsized; and, on April 24,

seven firms (two large business firms and five small) on the Source List were solicited, and bid sets were mailed to the SBA Office. Bids were to be returned by May 6. Without requesting it, company II received a copy of the bid set from the SBA. Company II was one of five bidders and issued a bid of $8 990, the range of all bids being from $6 650 to $13 004. MSC, upon evaluation of all bids, stated that: "the proposal from [Company II] is the only one fully to meet or exceed the specifications delineated in the RFP. It has the further advantage of having previously been qualified for flight by NASA." On May 23, in accordance with a telephone conversation regarding the price breakdown previously submitted, the company confirmed a price revision to $6 316.75. On May 31, a fixed firm price contract for the transmitters was made in the amount of $6 316.75 and with a delivery date of August 8, 1963.

On August 30, 1963, the firm offered a monetary concession of $100 in consideration of its failure to deliver the items on time and received an extension until September 15, 1963. The first of the two items was delivered on January 22, 1964, and the second on February 6, 1964. Upon testing and evaluation the first unit was found not to meet the specifications and was sent back to the contractor on February 18, 1964, for repairs to make it acceptable. On March 4, 1964, MSC transportation was notified that the unit sent for repair was being held by the Railroad Express Agency which further advised that delivery had been attempted but that the company had closed its doors to business. Upon reaching the head of the company, MSC was informed the firm had not declared bankruptcy but that a creditor's committee had been appointed in an attempt to liquidate the firm. One more attempt was made to repair the units and they were again returned to MSC on July 10, 1964, for testing and evaluation. Neither unit met required specifications. On March 29, 1966, the equipment was no longer required and the contract was closed out in the best interest of the Government.

Profiles of Companies I and II

As already shown, marked similarities between the two firms did exist at the time of contracting with MSC. The following paragraphs are devoted to the problem of establishing what respective factors contributed to the success of one company and the failure of the other.

Within MSC it is well known that the controls exercised over the manufacturer of manned space-flight equipment are exacting and that Quality Control and Reliability requirements are rigid. The same knowledge is gained through the experience of contracting with MSC. Company I had previous space-flight contracting experience and thus had an inherently better insight as to what would be expected of it technically. Therefore, previous experience and the knowledge gained therein was a factor

in the successful completion of the contract in Case I. Accordingly, this lack of knowledge was also a contributing factor in the failure of company II.

The other factor which seems almost blatant was the difference between the proposal price and the negotiated price of contract II. The difference of $2 673 represents a revision and reduction of price by almost one-third. Upon closer examination one also realizes that less than 9 months later this same firm has closed its doors, filed bankruptcy, and gone out of business. Three possibilities are evident: (1) Either the firm was having financial difficulties at the time the contract was undertaken; or (2) the contract was instrumental in creating the financial difficulties which caused the company to fail; or (3) the first and second possibilities were jointly responsible for the failure of the firm. If the first theory is true and the proposal price was indeed an accurate estimate of cost (this factor would tend to be supported by the proposal costs submitted by the other bidders), then accepting the contract at the negotiated price was a poor decision on the part of the company management.

If the second possibility is true, then the firm's management would seem to have grossly overestimated the firm's physical, financial, and technical capabilities. These circumstances would also indicate a lack of continuous communication between MSC and the small business firm on the fixed-price contract. If this communication had been maintained, MSC would have known of the firm's difficulties, possibly soon enough to assist in avoiding the default. This assistance would have been to the best advantage of both MSC and the small business firm.

The information presented in the preceding report section*, which hypothesized that prior Government or MSC R&D contracting is not necessarily essential for successful completion of contracts, further substantiates evidence that the most important contributing factor in the success of a firm is a sound management with a realistic picture of the firm's physical, financial, and technical capabilities. Conversely, the lack of such management is a great liability to the successful completion of R&D type contracts and to the relative success of the firm.

CONCLUSIONS AND RECOMMENDATIONS

As has been shown in this report, the smaller companies can and are generally willing to compete on an equal basis for Government business in their specialized fields. Many are able--because of lower overhead,

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*Analysis of Small Business R&D Awards.

lower cost of operation, special skills, and quick response to requirements--to perform efficiently and at lower prices than the larger companies. The fact that many of the small business firms successful in prime contracting were able to rival large business firms in terms of technical competency is perhaps a tribute to their particular skills more than to the direct encouragement of MSC and its Small Business Program.

Subcontracts are also included in the Small Business Program and this is the mode in which small business firms have the best opportunities of sharing in MSC contract programs. Every effort is made to place as many prime contracts as possible with small businesses, but a large portion of MSC dollars go into the major contracts. Because small companies or even combinations of small companies lack the experienced engineering staffs, extensive facilities, and substantial capital which are required to perform large contracts for the development of space vehicles, the proportion of total dollars going to small business by prime contracts is minor. The large prime contracts might possibly be broken down into small component parts upon which small business firms could openly compete, but this policy is not feasible. The ensuing problems concerning the coordination which would be required for the successful completion of a total project certainly outweigh any advantages which might be gained.

The Small Business Set-Aside Program has also enjoyed a degree of success, but the very mission of MSC precludes using the program in many cases. MSC is looking for the firm, regardless of its size, which has a high degree of competency and offers the greatest possibility for successful completion of the contract requirements as well as for low cost and high performance.

A review of the Small Business Program as a whole and of the data presented lead to the following conclusions and recommendations:

1. MSC must anticipate the strengthening of the role of the Small Business Administration Representative. Presumably, by the end of August 1967, this officer will assume a positive equal in status to that of the MSC Small Business Specialist. Even if this proposed change does strengthen the overall Small Business Program, MSC must be prepared both for the increased difficulty in coordinating procurements and for the greater length of time involved.

2. MSC should realize that small business firms are not satisfied with assuming subcontracting as their major role in procurement, even though this area is the most fruitful for them. This view is understood by the Small Business Office but not by all technical personnel at other MSC organizations.

3. The use of fixed-price contracts may contradict the Small Business Program by placing a greater risk upon small business/small contracts than on large business/large contracts. Therefore, whenever possible, greater use should be made of CPFF.

4. More CPFF contracts should be used because better compensation would encourage more competent small business firms to compete for MSC R&D procurements.

5. If small business firms are willing to assume a greater risk, then placing a larger number of procurement actions with small business firms would seem to be advantageous to MSC.

6. Where possible, sections of the Vendor Source List should add a greater breakdown of capabilities to insure against loss of time in procurement actions.

7. To insure equal opportunity of all firms to participate in procurement, more extensive coordination of Source List rotation should be accomplished.

8. Information concerning the Small Business Program should be more completely disseminated to the MSC technical personnel. This effort could involve both a series of lectures by MSC Procurement personnel and some general literature to be made available to technical personnel.

9. The thorough examination of the financial status of a small business firm before proceeding with procurement action would seem to be in the interest of MSC. This action is particularly necessary in the case of small businesses seeking an award from MSC for the first time.

10. On unusual or complex procurements, even if on a fixed-price contract, regular contact with the firm should be maintained to insure that MSC has a knowledge of potential problems. This is a responsibility of both contracting and technical personnel.

11. More personal contact is needed between small business firms and MSC personnel at all levels, so that a greater knowledge of their respective requirements and capabilities will exist.

These 11 recommendations provide a framework by which the MSC Small Business Program could be strengthened and made more effective. Of course, for the Program to be truly successful, changes and increased efforts must be made by both MSC personnel and small business firms. Logically, however, MSC should take the initiative in trying to solve some of the specific problems which have been presented.

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APPENDIX A: QUESTIONNAIRE

April 5, 1967

Gentlemen:

It is the policy of the National Aeronautics and Space Administration, Manned Spacecraft Center, to place a fair proportion of its total purchases and contracts for supplies and services with small business concerns, and to afford small business an equitable opportunity to compete for contract awards. In the area of research and development contracts, the policy is to award such contracts to those organizations having a high degree of competence in the specific branch of science and technology required for the successful conduct of the work. It is in the national interest that the number of firms engaged in R&D work for MSC be expanded and that there be an increase in the extent of participation by competent small business firms.

As a graduate student of the University of Oklahoma, I am making a study of the NASA MSC Small Business Program. This study is being made under the direction of, and with the full cooperation of, the Manned Spacecraft Center. The attached questionnaire has been designed to gather some of the required information. Will you please help us by completing this questionnaire and returning it to us by April 25. A self-addressed, stamped envelope has been enclosed for your convenience.

Your cooperation will be appreciated.

Sincerely yours,

Suzi Mollison

Enclosure

QUESTIONNAIRE

1. Type of Business: _____% Mfg. _____% R&D _____% Services

2. Number of Employees: _____ Total _____ Scientist & Engineer

   _____ Other Technical

3. Length of time in business? _____

4. Field(s) of specialization? _____

   _____

5. Are you on the MSC Source List? _____ For how long? _____

6. Are you acquainted with the Small Business and Industry Assistance Office at MSC and its purpose? _____

7. Have you done Government R&D contracting? _____

8. Have you done R&D contracting for NASA MSC? _____

9. From your point of view, how successful has the Small Business Contracting Program been? Please explain your answer.

   _____ (20 percent - Highly successful)*

   _____ (27 percent - Moderately successful)*

   _____ (53 percent - Little or no success)*

10. What are the major problems faced by your company in competing for MSC R&D contracts?

    _____

    _____

    _____

    _____

    _____

*Percentage of total number of replies received to respective question.

11. AFTER being awarded an MSC R&D contract what have been the greatest problems faced by your company.

_____

_____

_____

12. Do you think that the Small Business Set-Aside Program has been successful? _____ Please explain your answer.

(39 percent - Yes)*

(61 percent - No)*

13. From your point of view how successful has the Small Business Subcontracting Program been? _____ Please explain your answer.

(33 percent - Highly successful)*

(9 percent - Moderately successful)*

(58 percent - Little or no success)*

14. Have you done subcontracting R&D work for a NASA MSC prime contractor? _____ Was it a satisfactory experience? _____ Please explain.

(45 percent had done subcontracting; and of these, 56 percent found it to be satisfactory)*

15. Do you find it easier for your company to secure R&D subcontracting awards from MSC prime contractors than receiving the prime contract itself? _____ Please explain your answer.

(64 percent - No)*

(14 percent - Yes)*

(22 percent - No difference)*

*Percentage of total number of replies received to respective question.

16. Do you prefer doing subcontracting work over that of prime contracting? _____ Please explain your answer.

(16 percent - Yes)*

(58 percent - No)*

(26 percent - No preference)*

17. From the viewpoint of small business, how successful do you feel the Small Business Program as a whole has been? Please explain.

(30 percent - Highly successful)*

(35 percent - Moderately successful)*

(35 percent - Little or no success)*

18. How actively have you, as a small business, pursued Government procurement? Please outline your methods.

19. Please give any other suggestions or additional comments you may have concerning the MSC Small Business Program.

*Percentage of total number of replies received to respective question.

APPENDIX B: CONTRACTORS AND CONTRACTS INCLUDED IN STUDY SAMPLE

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Contractor	Location	Contract number	Value of award (in dollars)	Description
Aerotherm Corp.	Palo Alto, Calif.	NAS 9 5430	83 900	Testing and evaluation of thermal protection system
Andonian Associates Inc.	Waltham, Mass.	NAS 9 95156	12 813	Variable temperature cryostatic calibration system
Applied Dynamics, Inc.	Ann Arbor, Mich.	NAS 9 5723	31 736	Analog computer
Applied Dynamics, Inc.	Ann Arbor, Mich.	NAS 9 6721	94 992	Analog simulation system
Ardel Corporation	Glendale, Calif.	NAS 9 5820	81 487	Study concerning parachute materials
Bay Laboratories, Inc.	Cleveland, Ohio	NAS 9 6114	11 472	Universal signal conditioning modules
Brice Company	Houston, Tex.	NAS 9 6468	11 082	Testing machine
Cohu Electronics, Inc.	San Diego, Calif.	NAS 9 5692	11 123	Video switching matrix
Cosmic, Inc.	Washington, D.C.	NAS 9 6305	28 300	Calculation of electrical charge on Apollo CSM in lunar environment
Custom Controls Co.	Houston, Tex.	NAS 9 95225	16 766	Explosion-proof trailer-mounted heating unit
Diffraction Ltd., Inc.	Bedford, Mass.	NAS 9 6489	56 336	Optic collimator
Dynamics Research Corp.	Stoneham, Mass.	NAS 9 5831	32 281	Torque measuring system
Eidal International, Inc.	Albuquerque, N.M.	NAS 9 95177	89 918	Helium semitrailers
Environmental Research Associates	Randallstown, Md.	NAS 9 6584	77 033	Early zero gravity simulation effort
Farrand Optical Co., Inc.	New York, N.Y.	NAS 9 6064	35 462	Star simulator and beam combination unit
Fifth Dimension Inc.	Princeton, N.J.	NAS 9 5860	50 000	Microminiature low-level multicoder
Gerber Scientific Instrument Co.	South Windsor, Conn.	NAS 9 5727	67 500	X-Y Plotter

APPENDIX B: CONTRACTORS AND CONTRACTS IN THE STUDY SAMPLE - Continued

Contractor	Location	Contract number	Value of award (in dollars)	Description
Heat Technology Lab.	Huntsville, Ala.	NAS 9 6616	124 900	Develop instrumented models for use in qualification of Apollo thermal protection
Heat Technology Lab.	Huntsville, Ala.	NAS 9 6080	10 000	Flat face probes
Instron Corp.	Houston, Tex.	NAS 9 6223	11 730	Testing console
International Machine & Tool	Providence, R.I.	NAS 9 6334	24 085	Dividing head
J. A. Maurer, Inc.	Long Island City, N.Y.	NAS 9 6187	32 700	Camera equipment
Medley Electronics Corp.	International Airport, Brownsville, Tex.	NAS 9 6236	305 875	Central electronics shop services
National Instrument Labs.	Rockville, Md.	NAS 9 6169	10 720	Microphotometers
Non Linear Systems Inc.	Del Mar, Calif.	NAS 9 6477	25 373	Digital voltmeter
Novatronics, Inc.	Pompano Beach, Fla.	NAS 9 6377	31 000	Multiple filter coherent spectrum analyzer
Optic-Electronic Corp.	Dallas, Tex.	NAS 9 5983	12 000	Optical measuring device
Optics Technology, Inc.	Palo Alto, Calif.	NAS 9 6615	14 973	Modulation transfer function analyzer
Physics Technology Laboratories	LaMesa, Calif.	NAS 9 5923	48 186	Investigation of lunar soil modification
Physics Technology Laboratories	LaMesa, Calif.	NAS 9 5854	22 000	Fabrication process for nominally spherical beads
Pritchett Eng. & Mach. Inc.	Houston, Tex.	NAS 9 5667	25 500	Fabrication Apollo cradle
Regent Jack Mfg. Co., Inc.	Downey, Calif.	NAS 9 6186	42 250	Mechanize virtual image projectors
Richardson Camera	Phoenix, Ariz.	NAS 9 5852	33 486	Film reader system

APPENDIX B: CONTRACTORS AND CONTRACTS IN THE STUDY SAMPLE - Concluded

Contractor	Location	Contract number	Value of award (in dollars)	Description
Rocket Research Corp.	Seattle, Wash.	NAS 9 5617	236 500	Hydrozine jet gem thrust chamber assembly
The Rucker Co.	Oakland, Calif.	NAS 9 5435	15 053	Environmental centrifuge housing
Sonex, Inc.	Philadelphia, Pa.	NAS 9 6591	89 850	Microminiature telemetry modification system
Spacelabs Inc.	Van Nuys, Calif.	NAS 9 5431	630 375	Medical equipment for Apollo spacecraft
Spacelabs Inc.	Van Nuys, Calif.	NAS 9 6649	98 000	Fabrication of propellant leakage detection system
Space Ordnance Systems, Inc.	El Segundo, Calif.	NAS 9 5689	626 846	Design, develop, and qualify a single bridge wire initiator
Technology Equipment Corporation	Denver, Colo.	NAS 9 95197	57 590	Microanalyzer
Thermco Products Co.	Garden Grove, Calif.	NAS 9 5825	33 222	Double-chamber diffusion furnace
Unholtz-Dickie Corp.	Hamden, Conn.	NAS 9 95122	21 580	Automatic calibration system and associated hardware
Vacudyne Corp.	Chicago Heights, Ill.	NAS 9 6348	63 300	Hyperbaric chamber
Vidar Corporation	Mt. View, Calif.	NAS 9 6376	55 514	Multiplex system
Video Engrg. Co., Inc.	Washington, D.C.	NAS 9 6090	21 919	Video distribution and test bay
Whistler Electronic Inc.	Northridge, Calif.	NAS 9 6352	10 567	Video patching and distribution

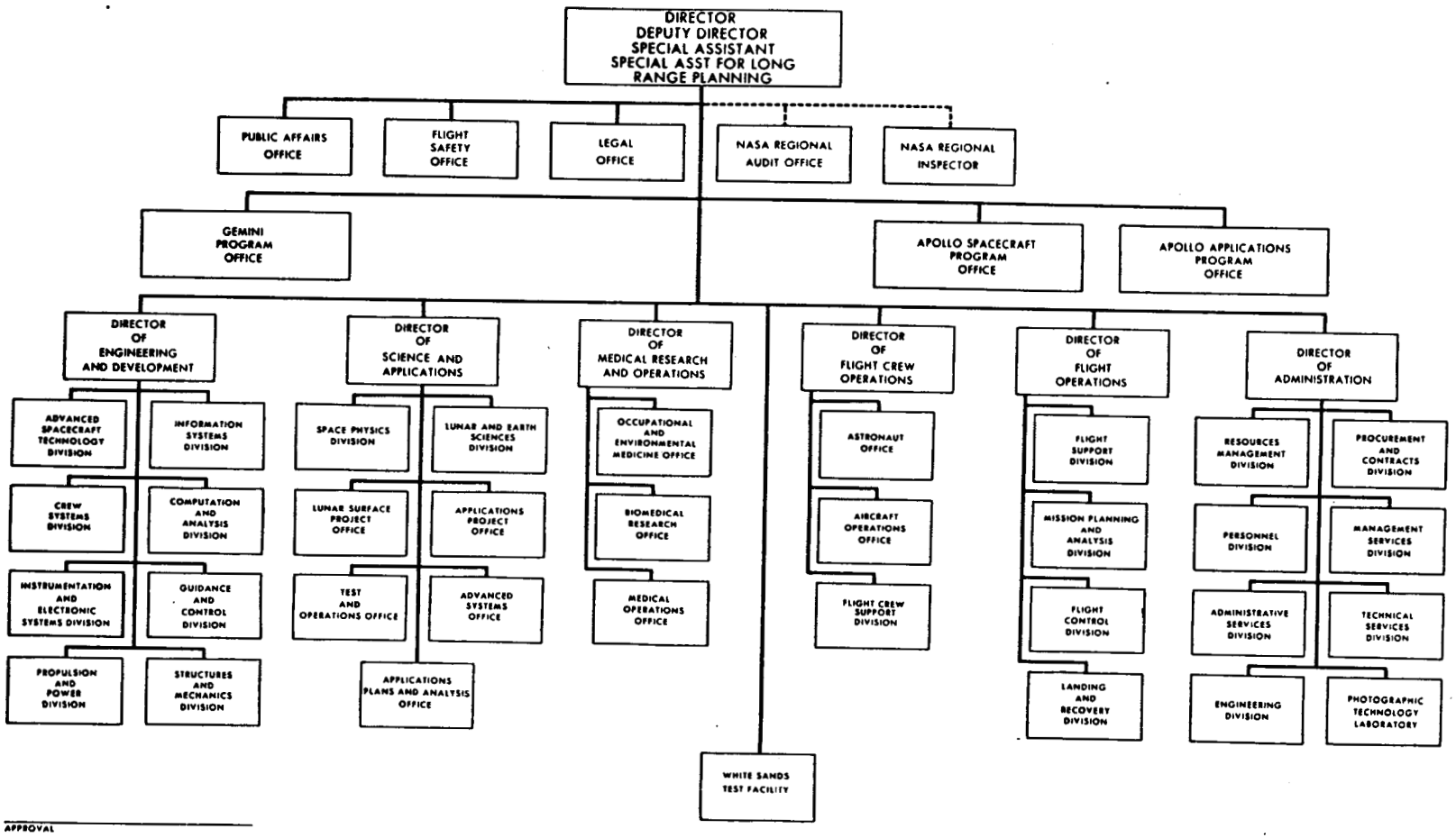
APPENDIX C: ORGANIZATION CHART OF NASA MSC

NASA S 66 11572 DEC 5

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

MANNED SPACECRAFT CENTER

HOUSTON TEXAS



APPROVAL

DATE