STATEMENT OF ROLAND TIBBETTS
PROGRAM MANAGER FOR INNOVATION AND SMALL BUSINESS
NATIONAL SCIENCE FOUNDATION
BEFORE
HOUSE SCIENCE AND TECHNOLOGY COMMITTEE
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THANK YOU FOR THE OPPORTUNITY TO PARTICIPATE IN THIS HEARING ON THE SUBJECT OF SMALL HIGH-TECHNOLOGY FIRMS AND INNOVATION. I WOULD LIKE TO DISCUSS THE NATIONAL SCIENCE FOUNDATION'S (NSF) SMALL BUSINESS INNOVATION RESEARCH PROGRAM WHICH IS A PROGRAM SPECIFICALLY DIRECTED AT THIS SUBJECT.

THE NSF SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM IS UNIQUE IN ITS APPROACH TO FEDERAL R&D. BASICALLY, IT IS DESIGNED TO ENCOURAGE AND SUPPORT SMALL HIGH-TECHNOLOGY FIRMS IN PARTICULAR THAT ARE QUALIFIED TO SUBMIT RESEARCH PROPOSALS ON REGULAR NSF APPLIED RESEARCH ACTIVITIES. HOWEVER, THE PROGRAM HAS SEVERAL SPECIAL CHARACTERISTICS. FOR EXAMPLE, IT ASKS THE QUESTION, "DOES THE RESEARCH SUBMITTED ON NSF PROGRAM OBJECTIVES ALSO HAVE POTENTIAL COMMERCIAL APPLICATIONS?" IF IT DOES, WE OFFER AN EXTRA POINT OF MERIT IN THE EVALUATION PROCESS. THE PROGRAM IS DIRECTED AT HIGH-RISK RESEARCH AND INNOVATION. POSSIBLY MOST IMPORTANT, IT PROVIDES AN APPROACH WHICH INVOLVES THE USE OF PRIVATE VENTURE CAPITAL TO PURSUE TECHNOLOGICAL INNOVATION AND COMMERCIAL APPLICATIONS AS AN EXTENSION OF THE NSF-FUNDED RESEARCH.

THE PROGRAM INVOLVES THREE PHASES. PHASE I PROVIDES SMALL AWARDS OF APPROXIMATELY $25,000 FOR SIX MONTHS PRINCIPALLY TO DETERMINE TWO THINGS: CAN THE SMALL FIRM DO HIGH QUALITY RESEARCH, AND DOES THE RESEARCH APPROACH APPEAR TECHNICALLY FEASIBLE. THOSE PROJECTS WHICH APPEAR MOST PROMISING AFTER THE FIRST PHASE RECEIVE PHASE II AWARDS. THIS IS THE PRINCIPAL RESEARCH PROJECT AND THESE AWARDS HAVE AVERAGED $200,000 FOR UP TO TWO YEARS. PHASE III IS THE DEVELOPMENT PHASE. IT IS PRIVATELY FUNDED TO PURSUE COMMERCIAL APPLICATIONS FROM THE NSF RESEARCH FUNDED IN PHASES I AND II.

WITH THIS OPPORTUNITY TO PURSUE COMMERCIAL APPLICATIONS FROM RESEARCH IN NORMAL NSF PROGRAM AREAS, WE ARE FINDING THAT IN ALMOST ALL PROPOSALS, MORE ATTENTION IS PAID TO THE PROPOSED RESEARCH TO SEE THAT IT HAS POTENTIAL COMMERCIAL USE. IN ORDER TO ADEQUATELY EVALUATE THIS ASPECT, WE REQUEST THAT THE SMALL BUSINESS OBTAIN A COMMITMENT FROM A THIRD PARTY, SUCH AS A VENTURE CAPITAL FIRM OR A LARGE BUSINESS. GOVERNMENT FUNDS ARE SPENT SOLELY ON RESEARCH MEETING NSF SUPPORT CRITERIA. PRIVATE VENTURE CAPITAL OR OTHER FUNDING IS SPENT ON PURSUING NEW PRODUCTS, PROCESSES, AND SERVICES FROM THE FEDERAL RESEARCH BASE.

THE PROGRAM IS DIRECTED AT INCREASING THE PRIVATE SECTOR RETURN ON INVESTMENT FROM FEDERAL R&D. IT ALSO PROVIDES AN OPPORTUNITY FOR THE SMALL FIRM NOT ONLY TO PARTICIPATE IN NSF RESEARCH, BUT TO FUND HIGH-RISK IDEAS THAT HAVE GREAT DIFFICULTY OBTAINING FINANCIAL

SUPPORT. THE PROGRAM ALSO HAS THE OBJECTIVE TO CONTINUE THE EMPLOYMENT OF THOSE PERSONS SUPPORTED BY NSF RESEARCH THROUGH PRIVATE INVESTMENT AND NEW PRODUCTS AND PROCESSES FOLLOWING THE END OF THE GOVERNMENT FUNDING.

THE SBIR PROGRAM IS HIGHLY COMPETITIVE. ONLY ONE OF EIGHT PROPOSALS RECEIVED HAS BEEN FUNDED, TO DATE. THESE HAVE BEEN VERY GOOD INDEED. THE NUMBER OF PROPOSALS RECEIVED HAS BEEN RAPIDLY INCREASING AND THE QUALITY OF THE PROPOSALS HAS IMPROVED WITH EACH SOLICITATION. IN OUR MOST RECENT SOLICITATION, SOME 530 PROPOSALS WERE RECEIVED IN 13 TOPIC AREAS LAST JANUARY. THESE PROPOSALS ARE CURRENTLY BEING REVIEWED, AND WE ANTICIPATE MAKING BETWEEN 50 AND 60 PHASE I AWARDS NEXT MONTH. THESE PROPOSALS CAME FROM 43 STATES AND THE DISTRICT OF COLUMBIA.

WE HAVE HAD THREE SOLICITATIONS TO DATE. THE FIRST WAS INITIATED IN 1977 FOLLOWING CONGRESSIONAL EARMARKING OF NSF APPLIED SCIENCE FUNDS FOR SMALL BUSINESS. THIS RESULTED IN 329 PROPOSALS, 42 PHASE I AND 21 PHASE II AWARDS. WE ARE APPROXIMATELY THREE-QUARTERS OF THE WAY THROUGH PHASE II ON MOST OF THESE PROJECTS. TWO HAVE ALREADY RESULTED IN OVER $4 MILLION DOLLARS BEING INVESTED IN TWO DIFFERENT COMPANIES, ONE INVESTMENT BY A VENTURE CAPITAL FIRM, THE OTHER FROM A MAJOR U.S. INDUSTRIAL FIRM. WE WOULD LIKE TO EMPHASIZE, HOWEVER, THAT THE LARGE FIRM DID NOT ACQUIRE THE SMALL FIRM FOR ITS MULTI-MILLION DOLLAR INVESTMENT. IT SIMPLY LICENSED RESEARCH DEVELOPED BY THE SMALL FIRM IDENTIFIED BY THE NSF PROGRAM FOR CERTAIN

APPLICATIONS. ANOTHER WINNER HAD SIX VENTURE CAPITAL POSSIBILITIES AND THREE $200,000 OFFERS AFTER PREVIOUSLY HAVING HAD NO SUCCESS ATTRACTING VENTURE CAPITAL INVESTMENT; AND THE VENTURE CAPITAL WAS ON FAVORABLE TERMS FOR THE SMALL HIGH-TECHNOLOGY FIRM. SURPRISINGLY, THIS FIRM ALSO RECEIVED $70,000 OF MATERIALS FREE AND EQUIPMENT FROM LARGE FIRMS AT HALF PRICE. WE HAVE FOUND CONSIDERABLE INTEREST FROM BOTH THE VENTURE CAPITAL INDUSTRY AND LARGE BUSINESS IN THIS PROGRAM.

AS ANOTHER EXAMPLE, A ONE-MAN FIRM WITH A LABORATORY IN THE PERSON'S BASEMENT AT THE TIME OF HIS APPLICATION NOW HAS EIGHT EMPLOYEES AND A NEW LABORATORY. ALTHOUGH A PRODUCT FIRM, IT HAS NOW WON FIVE OF SIX R&D PROPOSALS SUBMITTED TO ONR, NIH, AND NSF, AND "A POSSIBLE BREAKTHROUGH OF NATIONAL IMPORTANCE" IN THE SEMICONDUCTOR INDUSTRY AS A RESULT OF THE SBIR PROJECT. IT ALSO HAS A $250,000 COMMITMENT FOR PHASE III SUPPORT, AND IS BEING CONTACTED BY IBM, TRW, UNIVAC, GCA, VARIAN, AND OTHERS. IN ANOTHER CASE, A FIRM HAS A POSSIBLE BREAKTHROUGH IN GENETICS AND ANOTHER IS PLACING A SINGLE ISOTOPE ON THE CUTTING EDGE OF MACHINE TOOLS WHERE A SENSOR CAN DETERMINE TOOL WEAR OR BREAKAGE. THIS PROJECT HAS THE INTEREST OF FORD, CHRYSLER, GENERAL ELECTRIC, RAYTHEON, AND A NUMBER OF FOREIGN COUNTRIES. THERE ARE PROBLEMS, HOWEVER, IN THIS LAST PROJECT BECAUSE OUR REGULATORY AGENCIES SAY IT WILL TAKE TWO YEARS TO CLEAR THIS IDEA BECAUSE OF THE ISOTOPE IN SPITE OF THE FACT THAT IT HAS RADIOACTIVITY AT ONE-THIRD THE LEVEL OF THOSE PRODUCTS THAT HAVE NOT REQUIRED NRC LICENSING. IN THE MEANTIME, JAPAN, SWEDEN, AND HOLLAND ARE MOST INTERESTED IN THE APPROACH, AND JAPAN HAS ALREADY HAD THE SMALL FIRM PRESIDENT VISIT THAT COUNTRY.

SINCE PHASE I PROPOSALS WERE SUBMITTED IN THE FIRST SOLICITATION, THOSE FIRMS RECEIVING PHASE II AWARDS, TAKEN AS A GROUP, HAVE DOUBLED THEIR EMPLOYMENT.

THE SECOND SOLICITATION RECEIVED 408 PHASE I PROPOSALS, AND MADE 54 PHASE I AWARDS. WE ARE JUST NOW RECEIVING PHASE II PROPOSALS. IN THE THIRD SOLICITATION, THE NUMBER OF PROPOSALS INCREASED BY MORE THAN 100, AND THE QUALITY ALSO IMPROVED AGAIN. THESE PROPOSALS ARE NOW IN REVIEW WITH AWARDS ANTICIPATED NEXT MONTH.

THE PROGRAM IS DESIGNED TO PROVIDE MANY INCENTIVES FOR SMALL FIRMS, AND TO SIMPLIFY THE FEDERAL R&D PROPOSAL PROCESS FOR SMALL BUSINESS. IT PROVIDES THE INCENTIVES OF MANY TOPICS AND AWARDS IN ONE SOLICITATION, THE CHANCE FOR A FOLLOW-ON AWARD IN PHASES II AND III, PATENT RIGHTS TO THE SMALL FIRM CONTINGENT UPON PHASE III FUNDING TAKING PLACE, FULL REIMBURSEMENT OF COSTS, AND A NEGOTIATED FEE. IT DOES NOT SUBSTITUTE PUBLIC FUNDS FOR PRIVATE FUNDS BECAUSE ALL PROPOSALS ARE SUBMITTED ON REGULAR NSF ENGINEERING AND APPLIED SCIENCE PROGRAM OBJECTIVES. THE PROPOSAL HAS TO MEET NSF EVALUATION REQUIREMENTS, AND GOES THROUGH OUR REGULAR REVIEW PROCESS IN PHASE II.

THE PROGRAM ALSO SIMPLIFIES THE FEDERAL PROCESS IN DEALING WITH SMALL FIRMS. IT COMBINES 13 TOPICS IN ONE SOLICITATION. THE WORKLOAD ASSOCIATED WITH THESE PROPOSALS IS DIVIDED AMONG A NUMBER OF PROGRAM MANAGERS LARGE ENOUGH TO PROVIDE EXPERTISE IN THE PROGRAM AREAS REPRESENTED. IN THE NEXT SOLICITATION THIS FALL, WE PLAN TO BROADEN

COVERAGE BY ADDING ADDITIONAL EAS PROGRAM TOPICS INTO A SINGLE SOLICITATION. PHASE I ALSO LIMITS PROPOSALS TO 20 PAGES. IT IS A QUICK SCREENING PROCESS TO GET A LARGE NUMBER OF PROPOSALS DOWN TO A MANAGEABLE NUMBER QUICKLY SINCE ONLY PHASE I WINNERS CAN SUBMIT PHASE II PROPOSALS. GRANTS ALSO ARE USED TO SIMPLIFY THE AWARDS MECHANISM. THIS IS PARTICULARLY USEFUL FOR SMALL-SCALE RESEARCH PROJECTS.

THE PROGRAM OPENS THE OPPORTUNITY DOOR WIDE TO MANY NEW AND PREVIOUSLY UNKNOWN BUT CREATIVE SMALL FIRMS. FIFTEEN THOUSAND COPIES OF THE PROGRAM SOLICITATION WERE DISTRIBUTED. FROM AN ESTIMATED 5,000 SMALL HIGH-TECHNOLOGY FIRMS, ONLY 530 PROPOSALS WERE RECEIVED, IN PART DUE TO THE CHALLENGING NATURE OF THE TOPICS. WE KNOW THAT AT LEAST SIX NEW FIRMS HAVE BEEN STARTED AS A RESULT OF THE NSF AWARDS. TO DATE, 52 PERCENT HAVE GONE TO FIRMS WITH 10 OR LESS EMPLOYEES IN COMPETITION WITH FIRMS UP TO 500 EMPLOYEES. THESE VERY SMALL FIRMS OBVIOUSLY COMPETE VERY WELL IN RESEARCH. THEY ALSO ARE HIGHLY INNOVATIVE IN MANY OF THEIR IDEAS, AND WE HAVE BEEN IMPRESSED WITH THE AMOUNT OF RESEARCH CARRIED OUT, PARTICULARLY FOR $25,000 OR LESS UNDER PHASE I.

THE PROGRAM HAS WIDE SUPPORT AMONG SMALL BUSINESS, VENTURE CAPITAL, AND MANY LARGE BUSINESS FIRMS THAT SEE SMALL BUSINESS AS A SOURCE OF TECHNOLOGICAL INNOVATION FOR LARGER INDUSTRY. COSIBA, THE COUNCIL OF SMALL AND INDEPENDENT BUSINESS ASSOCIATIONS AWARDED NSF ITS FIRST AWARD FOR FEDERAL SMALL BUSINESS PROGRAM EXCELLENCE. AS A RESULT OF

THE DOMESTIC POLICY REVIEW ON INDUSTRIAL INNOVATION, THE PROGRAM ALSO WAS CITED AS ONE OF THE PRESIDENT'S INITIATIVES FOR EXPANSION TO THE $150 MILLION LEVEL IN OTHER AGENCIES AS WELL AS NSF. FOREIGN COUNTRIES HAVE ALSO SHOWN GREAT INTEREST, PARTICULARLY JAPAN, WEST GERMANY, BRITAIN, FRANCE, HOLLAND, AND SWEDEN.

AT NSF, WE ARE CONTINUING TO REFINE THE PROGRAM AND ARE CONSIDERING SOME OPTIONS SUCH AS USING MORE TOPICS TO RESPOND TO MAJOR U.S. INDUSTRIAL PROBLEMS. THE PROGRAM ALSO ENCOURAGES THE SMALL FIRMS TO INCREASE THEIR RESEARCH CAPABILITIES BY WORKING WITH UNIVERSITY SCIENTISTS AND ENGINEERS. ABOUT ONE-HALF OF THE WINNERS, TO DATE, HAVE DONE SO. IN COOPERATION WITH SBA, WE ARE ALSO WORKING ON THE RELATED MANAGEMENT, FINANCING, AND MARKET RESEARCH NEEDS OF THESE SMALL TECHNOLOGY-BASED FIRMS. STATES ARE ALSO SHOWING MUCH MORE INTEREST SINCE THE BIRCH REPORT ON THE JOB GENERATION PROCESS, AND WE WORK CLOSELY WITH SUCH ORGANIZATIONS AS THE MASSACHUSETTS TECHNOLOGY DEVELOPMENT CORPORATION. MTDC ASSISTS MANY SMALL FIRMS PRIOR TO SUBMITTING PROPOSALS, AND ALSO IN OBTAINING FOLLOW-ON VENTURE CAPITAL COMMITMENTS.

FINALLY, NSF, SINCE ITS FAIRLY RECENT INTEREST IN SMALL TECHNOLOGY-BASED FIRMS, HAS CONDUCTED INTERAGENCY CONFERENCES THROUGHOUT THE COUNTRY ON FEDERAL R&D FOR SMALL BUSINESS FIRMS. THROUGH OUR OFFICE OF SMALL BUSINESS R&D, HEADED BY TED WIRTHS, WE ALSO PUBLISH THE

HIGHLY USEFUL SMALL BUSINESS GUIDE TO FEDERAL R&D. ALSO SMALL BUSINESS CAN AND DOES SUBMIT UNSOLICITED PROPOSALS TO NSF IN THE APPLIED RESEARCH AREA. THESE PROPOSALS ARE REVIEWED AND AWARDED USING NORMAL NSF PROCEDURES. OUR INNOVATION CENTERS ASSIST SMALL FIRMS NOT ONLY IN TECHNICAL BUT ALSO IN MANAGERIAL AREAS AS WELL AS STIMULATE START-UPS AND TEACH COURSES IN ENTREPRENEURSHIP.

A SUMMARY OF NSF APPLIED SCIENCE FUNDING TO SMALL BUSINESS AND A LIST OF ALL AWARDS MADE UNDER THE 1979 SOLICITATION ARE ATTACHED TO THIS STATEMENT.

DR. BOURNE AND I WOULD BE GLAD TO ANSWER ANY QUESTIONS YOU MAY HAVE.

Mr. BROWN. Thank you very much for that very stimulating presentation.

May I call on Dr. Levin and Dr. Edwards to make any comments they wish.

Dr. LEVIN. Shall I lead off?

Mr. BROWN. Yes.

Dr. LEVIN. I do want to say, from the standpoint of small business that I think the NSF SBIR program that Mr. Tibbetts just described, which I really believe that he invented, is an outstanding example of an attempt to do something about small business innovation.

The question that I would have for him, however, is what happened this year? I thought we were talking about $10 or $15 million as an increase. As I read in the paper that was omitted in the budget.

Mr. TIBBETTS. I think maybe that is more appropriate for Dr. Bourne to answer.

Mr. BROWN. Dr. Bourne.

Dr. LEVIN. Thank you.

Dr. BOURNE. I am Henry Bourne, Deputy Assistant Director of the Engineering and Applied Science Directorate of NSF.

In the January budget, it was increased along with the $3 million which is shown here.

Mr. LLOYD. Could I interrupt?

Dr. BOUNRE. Yes.

Mr. BROWN. Mr. Lloyd.

Mr. LLOYD. Would you mind taking a seat at the table so that we can hear you. Then let's start over so that we can hear you. Use the microphone.

Dr. BOURNE. In the January budget, the program was increased from a level of $3 million to $13 million. But in the attempt to balance the budget in March, this is one of those programs which, having had such large increases, was also obviously a target for cuts. The final figure arrived at was $6 million. So, it was an increase from $3 million to $6 million.

Mr. LLOYD. I might point out that in the most recent conference agreement that we will be looking at, science, space and technology will receive an additional $100 million in it. I can only address the general part of it. But since it is an increase, we will make the assumption that maybe some of the funds that you were talking about had been restored. I would hope so.

Dr. BOURNE. I have no personal knowledge of that.

Mr. LLOYD. Thank you. I don't either, but we have to pass it.

Dr. BOURNE. Yes, sir.

Mr. LLOYD. Thank you, Mr. Chairman.

Mr. BROWN. Will you yield?

Mr. LLOYD. Yes.

Mr. BROWN. This is in reference to the science item in the budget resolution which we will be acting on later today, and which has been the subject of some controversy. It has not been specified at the level of detail so it would be possible to assess its impact on this particular program. But in our authorizaion legislation, if I may refresh my memory, we did not go along with the President's proposed cut.

Mr. LLOYD. That's correct, Mr. Chairman.

Mr. BROWN. We will try to assist in getting, both in the authorization and, hopefully, in the appropriations bill, something closer to the original January figure.

I would have a question as to whether even this would be adequate in light of the figure of $150 million that you mentioned throughout the various departments. We will have to find out how those other activities are doing as well. This is in an effort to see how large this program can become.

Dr. BOURNE. The funding in this particular program that you heard described is not the total funding for small business in the direct engineering and applied science. There were a whole group of proposals that would add considerably to the total.

Dr. LEVIN. I am glad to hear there is still some hope.

Dr. BOURNE. Yes.

Dr. LEVIN. I think it has been a good landmark program, Mr. Chairman.

Dr. BOURNE. Thank you.

Mr. BROWN. Are there any comments at this time on this, Dr. Edwards?

Dr. EDWARDS. Yes.

Mr. BROWN. Go ahead.

Dr. EDWARDS. In my testimony the day before yesterday, I indicated I felt the Government had a great deal of leverage in causing the expenditure of private capital in ventures regarding technology. I was delighted to note here that the testimony given by Roland Tibbetts showed that, indeed, is the case. I believe the reason for that is that, maybe, perhaps like many Congressmen, those that don't have technical backgrounds, they are not quite sure at the time which way to go. But if a scientific agency will back a technology, that generally will give some degree of confidence to a venture capital group or investor. I can't overemphasize how important the Government role in leveraging the cash out of large companies or out of wealthy foundations of investment groups into small technology.

My only other comment, Mr. Chairman, is that the phase I, or my question really is that the phase I, that would be money going in for the initial study. Are those almost all studies and they don't require hardware? They are very small funding numbers.

Mr. TIBBETTS. Yes. We restrict any purchases of equipment from that money. We are looking for the small firm to prove its capability to do research as well as the feasibility of their idea in a small amount before we invest in phase II in a larger amount. Essentially, it is a fly before you buy approach.

Dr. EDWARDS. I think that is certainly a good approach, Mr. Tibbetts. It should be noted that the Government spends about $75,000 per man-year. So, we are talking about something like a third of a man-year, or $25,000.

Mr. TIBBETTS. That is correct.

Dr. EDWARDS. Thank you.

Mr. TIBBETTS. I think in the small firms, however, we are getting a little bit more for the money.

Dr. EDWARDS. Yes.

Mr. BROWN. Now, Mr. Tibbetts, the phase I effort, does that include not only the definition of research and development, but do you make an effort to encourage a plan for the enterprise to proceed beyond the research and development to the commercialization phase and the other kinds of plans that are necessary, such as market analysis and something of that sort?

Mr. TIBBETTS. To a degree, yes. The current phase I solicitation looks like this. In this solicitation, we ask the small firm whether the research that they are proposing on the objectives also has commercial potential. If it does, we will give them an additional point of merit in the evaluation process.

In other words, if other things are approximately equal, they will receive the award. We are looking for the small firm to consider the commercial potential of the Government research from the beginning of the research planning process rather than after the R. & D. has been completed or hardware produced. I think that may be too late in the technology transfer in many cases to get the transfer. However, we are restricted to funding research. That does not include the market research. We have been working with SBA in a cooperative effort to provide some market and management assistance. The have put up some of the money to try to assist these firms in these areas.

Mr. BROWN. Now, Mr. Tibbetts, I might differ with you just a little bit on whether NSF is restricted to funding research, but I won't go into that point right now. There is a rollcall on. In order to allow the members to make that, I am going to call a recess for about 10 minutes.

If you gentlemen will be kind enough to remain, we will return.

We will be right back.

[Short recess.]

Mr. BROWN. The subcommittee will be back in order at this time.

Go ahead, Dr. Edwards.

Dr. EDWARDS. I had just finished. But I would like to continue with another comment.

Dr. EDWARDS. I certainly, very definitely, would laud the concept of phase I and phase II and the leveraged phase III program that NSF has instituted.

However, there are probably a number of companies like my own that have gone far past phase I and would not go through the phase I. So, I think, really, that the NSF program that I am looking at here sounds like the startup company type program. There are ongoing companies that have already invested a great deal of their own funds so the phase I would be phase II.

I certainly would like to suggest that there be means within this total program that phase I could be eliminated, and there be the opportunity to leapfrog to phase II which could be considered. The $50,000 begins to be a number that can be usable in a technology that has some complexity and does require several man-years for realization. I would like to make that comment, Mr. Chairman.

Mr. BROWN. Thank you.

Dr. EDWARDS. Yes, sir.

Mr. BROWN. Is there any response?

Mr. TIBBETTS. We, of course, have considered that extensively. One of the problems you realize is that everybody would like to jump to the $250,000 level. We have to have a screening process when dealing with a large number of small firms to get down to the very most competent ones. That is why we use the phase I and phase II.

Mr. BROWN. Dr. Edwards.

Dr. EDWARDS. I believe that there might be a way that you could save $25,000 in determining whether a company has the capability or not.

Mr. TIBBETTS. We are considering some alternatives, Mr. Chairman.

Mr. BROWN. Yes.

Mr. TIBBETTS. It was mentioned this morning. This can be considered.

Dr. EDWARDS. Thank you.

Mr. BROWN. I am sure that we haven't exhausted this, but are there any comments with regard to the Department of Energy's description of their program?

Dr. EDWARDS. Yes.

Mr. BROWN. Go ahead.

Dr. EDWARDS. I do have some comments or questions that I would ask of Mr. Tashjian.

I will lead you just a bit, if you don't mind. I realize you have a tremendous job on your hands. I also realize that DOE has been a mixture of a number of agencies and it is now just probably getting on its feet. I would like to quote a statistic that I thought was particularly interesting that I got from NASA. That is, if every automobile in the United States got 1 mile per gallon better in mileage, that would pay for every commercial and general aviation gallon of fuel used. It is 1 mile per gallon.

Now, with that as a background, I would like to ask you if there would be any interest in DOE as to an innovation that would save approximately 1 mile per gallon and, in so doing, to further diminish the release of the carbons into the atmosphere?

Mr. BROWN. Mr. Tashjian.

Mr. TASHJIAN. I am not a technical man. I am a procurement man. If you are asking a technical question, then, of course, we will save energy. We want to do that.

Dr. EDWARDS. Yes.

Mr. TASHJIAN. If you are advocating a particular product, let me just say that we have a very active unsolicited proposal program. We accepted about 50 percent of the unsolicited proposals sent to DOE last year. Of that, approximately $25 million of those awards went to small business. If you say that the NSF program is good, then our other program is unlimited. NSF specifies from 12 or 14 areas what they want. We will take any suggestion in any technology area that has anything to do with energy savings. I think that we have probably one of the most enlightened unsolicited proposal programs in the Federal Government.

In addition, 2 years ago, we began unsolicited proposal reserve programs. We put a fence around money exclusively for the small business concerns because some small business concerns said that they can't compete with the big ones. We put money aside specifically. This is the third consecutive year that we have negotiated with the Assistant

Secretaries for Conservation and Solar Energy and Fossil Energy and the Director of Energy Research as to specific amounts to be set aside exclusively for unsolicited proposals from small business companies. Yes, we are interested.

Dr. EDWARDS. I would imagine that you would be interested in that, especially if the performance of the system was shown in the tests to be double that of conventional systems.

Yet, I hear your response, and I am sure that the logical answer to this is yes. Yet, I must tell you myself and two of my chief scientific people have been from pillar to post for 2 years, from Oak Ridge to Washington, in submitting this.

Mr. TASHJIAN. Did you get a response on the evaluation, Dr. Edwards?

Dr. EDWARDS. We have gotten responses from the sense that we see someone else. We haven't gotten any place. It makes us feel, and this could be very unfair and a very isolated circumstance, but we feel, our organization feels that there is not a clear channel of where we can go. I would like to know how we might verify that.

Mr. TASHJIAN. Yes; but I am not preapred to evaluate the merits of a technical proposal that was submitted and returned on its technical merits because it gets a review by qualified technical people. As to the totality of the unsolicited proposal system, we have an automated system which acknowledges every single unsolicitated proposal submitted. It sends a letter to the submitter. It gives you the number the department assigned to the proposal. It tells you who is evaluating it. Moreover, I stratify them so that, with the older ones, I can take action to complete the evaluation process. Each month I send each assistant secretary a list of unsolicited proposals they have had in-house over 6 months. There is a very structured institutionalized system for acknowledging, reviewing, and tracking unsolicited proposals. If you feel that you have submitted one that has technological merit and it has been turned down, I will try to arrange for you to meet with the technical people involved in the evaluation of your submission.

Dr. EDWARDS. If it had been turned down, that would be one thing, but it hasn't turned at all. That is the problem. I feel it has fallen into a crack somewhere. I have heard that is not an uncommon occurrence. Perhaps the procedure that you have has some leaks in it that you might want to look at.

Mr. TASHJIAN. I'd be very happy to look into the specifics. We handle thousands of unsolicited proposals. This may be possible. I would be glad to look into it.

Dr. EDWARDS. Thank you.

Mr. TASHJIAN. Yes.

Mr. BROWN. Dr. Levin.

Dr. LEVIN. Thank you. I can't resist thinking that we are at a crossroads here with two extremely important issues, small business innovation and energy. They do come together in some fashion.

Mr. LLOYD. Excuse me.

Dr. LEVIN. Yes.

Mr. LLOYD. You would not want to call in a third one, and call it government and bureaucracy, would you? I thought that I'd ask you.

Dr. LEVIN. It seems to me that, Mr. Chairman, from my view out of a small R. & D. firm having physicists in it, from having talked with physicists, that the true, long-term solution to our near-disastrous energy problem is fusion energy.

I would like to ask Mr. Tashjian what percent of the DOE budget is going into fusion energy? Does DOE conceive this as an urgent research area? Second, what could the role of small business research and development firms be in the fusion energy program? Obviously, they can't build a Tokamak, or things of that scale, but I do think that there are subsystems, or areas, in which they might participate.

Mr. TASHJIAN. I didn't come prepared to tell you this, but I do know that we have an active, ongoing fusion program. I do know that we do have an interest in fusion. I know that fusion is targeted for success in the 20th century. It is a long-term, not a short-term program.

I think, for the purpose of this hearing, there is far more interest in what can be done this year and next year, and in the near term, to solve our energy problems.

DOE is looking at mid-term and long-term solutions to energy problems. I think that I would really have to put fusion in the long-term category, Mr. Chairman.

Mr. BROWN. Let me follow up on that.

Dr. LEVIN. Yes.

Mr. BROWN. I think that I can interpret what Dr. Levin is focusing on. The fusion energy program, which has $0.5 billion more or less in it, this is not excluded from these procedures involving small business.

Dr. LEVIN. It certainly is not.

Mr. TASHJIAN. It is not.

Mr. BROWN. So, there should be opportunities even within a complex advanced program of that sort for proposals from small business.

Mr. TASHJIAN. Yes. But I think, in all fairness, namely in the subcontract area, research is performed at the Tokamak facility and the miniaccelerator facility at Stanford. We give those concerns small business or percentage goals. Thus, in their placing of procurements with subcontractors, they are to take steps to insure that as many as practicable are awarded to small businesses. We will have an award program for this. For the past 3 years, I have met annually with the heads of the procurement activities of the large projects—the Government-owned, contractor-operated facilities—in which we discussed what we could do to increase the awards to small and minority businesses. I put numbers out. We have set-aside authority and passed this on to these contractors. Generally, only the Federal Government makes set-asides, but these Government-owned, contractor-operated facilities now have been allowed to, and directed to, use set-asides as well. They will capture a portion of the subcontract opportunities for small business, sir.

Mr. BROWN. Dr. Levin.

Dr. LEVIN. I'd like to continue on the fusion subject, Mr. Chairman.

Mr. BROWN. Yes.

Dr. LEVIN. I recognize that much of it lies beyond the capability of small business to participate. On the other hand, there are some surprises that come out of small business, such as fusion techniques that have promise.

I don't agree that fusion should be regarded as a midterm or long-term program. It seems fairly axiomatic to me that the United States, or any country that is denied energy, or runs out of energy, is going to take some awfully drastic steps—including military—to get energy. We have learned the cost of those kinds of steps. It runs into the hundreds of billion of dollars.

Now, I am really at a loss to know why the Government does not call fusion research an urgent area and massively attack this problem. There has been some extraordinary success in advancing basic fusion. We are almost at the break-even point now with respect to fusion energy. It can certainly be made to yield before the 21st century. At least that is the opinion of many of the physicists with whom I have talked. I would hope that there would be a place for small business to aid in some of the breakthroughs needed.

Mr. BROWN. Do you have a more recent update on this?

Mr. LLOYD. Will you yield for a moment first?

Mr. BROWN. Mr. Lloyd.

Mr. LLOYD. Thank you, Mr. Chairman. I don't have anything to add, but I do have some questions to ask.

Now, Dr. Levin, given what I call the nuclear syndrome, nuclear as it pertains to some of the people in the United States, as evidenced by "The Three Mile Island attitude," and in no way am I saying that these people have no right to be concerned, and I don't happen to agree totally with the attitude here, it is absolutely one that does exist. These are opinions whether you agree or not. The opinion exists.

Now, given that kind of situaton, that kind of a culture in which to operate, how much would you propose, or how do you propose then to go forward on the things that you are suggesting? You have automatic resistance that is built into it.

Dr. LEVIN. The first thing that we need is an educational program to teach the public the difference between fission and fusion.

Mr. LLOYD. Can I ask this?

Dr. LEVIN. Yes, sir.

Mr. LLOYD. How is the public educated today?

Dr. LEVIN. Through TV and newspapers.

Mr. LLOYD. Now, given, and I concur, it is radio and television, newspapers, word of mouth, and given those variables in the formula, how are you going to educate them? Can you comment on that?

Dr. LEVIN. They can be made aware.

Mr. LLOYD. Who is they?

Dr. LEVIN. The public can be made aware.

Mr. LLOYD. Let's go back to my question.

Dr. LEVIN. Yes.

Mr. LLOYD. We were together. We got down to this. They said if they could be made aware. The only way I can make them aware is for the media to respond in a given method. How are you going to get the media to respond?

Dr. LEVIN. First, I think that our leadership, which I really believe has been deficient in this area, should step forward.

Mr. LLOYD. Could you define leadership? Who are the opinion-makers?

Dr. LEVIN. I have been surprised at the President, that he hasn't championed the subject of fusion. Fusion has been on the verge of pub-

lic discussion many times. Considering the urgent energy need of the Nation, fusion has not been adequately mentioned. I think at his level, and on down, that it should be made clear to the media and to the public that there is a great difference between fission and fusion. The fears that the public has for fission don't necessarily apply to fusion.

Mr. LLOYD. Thank you.

Now, this really offers a much broader scope of the kind of energy that the country needs for a clean environmental impact.

Mr. LLOYD. Obviously, you are correct as to the differences that exist between fission and fusion. But I am going to try to force you back into the various things that you are talking about, which really are the problems of communication. Education certainly falls into this. You say that the President has not articulated the policy. The President has articulated the policy. If you watched closely as far as this committee is concerned, and was it, Mr. Chairman, 2 or 3 years ago that we got wrapped around the axle on the Clinch River breeder reactor——

Mr. BROWN. It was 3 years ago.

Mr. LLOYD. The President was clearly involved in this. He was involved to the extent that he was lobbying individual members of this committee. You can't say that the President has not been involved. He may or may not have changed his opinion. I am only pointing out that you were trying to educate, and I, too, am willing to educate. I do not say that you are in error. All that I am trying to say is, have you considered these facts and the variables that go into it, one of which is communication in the educational process? I used a word a minute ago probably very unfairly. I was trying to be facetious. I am now trying to be serious. I used the word bureaucrat. As a result, I elicit a certain emotional response in doing that, That is unfair. You know what I was doing when I did it. It was a function of, perhaps, some humor and maybe not well placed. It was done that way, and you know this.

In dealing with the technological problems that we have, and our good friend from NSF, Mr. Tibbetts, is probably more keenly aware of this than anyone in the room, which is as to what the media can do to you over a very legitimate project. Am I correct?

Mr. TIBBETTS. Yes; I think all NSF knows that very well.

Mr. LLOYD. As a result of this, Dr. Levin—and I am sure that Mr. Tibbetts would agree with me—one of the major problems in educating people is that we have to take a look at the educational tools.

Very frankly, Doctor, I think more folks know a great deal more about this and read more of Doonesbury than they do of some of the reports that we are talking about. If Doonesbury doesn't discuss fusion and fission, and I don't think that he is going to, you have a problem. I have a problem. I am not denying my role in this whole thing. You have to really recognize the limitations of people like myself. Indeed, I am not capable in the areas of expertise that you are, or that you were, discussing, such as somebody like Mr. Brown is. You really find a very unfertile field in these hallowed halls when you talk about all of these things. Don't gloss over them when you discuss them. One of the major problems that we have is communicating and educating. Tell me how to communicate with people so that I can get the points across. It is not only that. Tell me how I can communicate with my colleagues.

Last, but not least, tell me how I can communicate with the administration.

Mr. BROWN. That is a very important question, but subsidiary to the thrust of this hearing, so I am not going to ask you to answer it.

I will point out, Dr. Levin, that many members of this committee share your views about the potential of fusion. They have attempted to develop a program for commercialization or major demonstration prior to the 21st century. The leader in that is Congressman McCormack, who is working very diligently to try to achieve that. We may have some success at it.

Now, let me get back, if I may, to Mr. Tibbetts for just a moment.

Mr. TIBBETTS. Yes.

Mr. BROWN. In the President's proposal last year on innovation and productivity, there was a proposal to expand the small business innovation program to other departments. Can you give us a report as to how much activity has occurred in getting other departments to follow the lead at NSF in this kind of a program?

Mr. TIBBETTS. I think NSF, both in that statement, and presently is in an assistance role. I think that the lead was given to OMB. We are ready to assisst any agency that wants to implement the SBIR program.

I can say there has been a telephone call to initiate looking into this with other agencies. I also have had meetings with two other major agencies so far.

Mr. BROWN. It doesn't sound like you have gone very far. I presume that there is a lack of funding in the other agencies for programs of this sort.

Mr. TIBBETTS. I don't know, but we stand ready to assist if we can.

Mr. BROWN. Now, Mr. Tashjian, I have a number of detailed questions which relate to the amounts that are going into the small business set-asides and the details of the unsolicited proposal program results which I am going to ask you, in the interest of time, to respond to in writing, if I might.

Mr. TASHJIAN. Yes.

Mr. BROWN. Are there any further questions at this time, Mr. Lloyd?

Mr. LLOYD. No further questions.

Mr. BROWN. Thank you very much, gentlemen.

Now, we have one more panel that I would like to get to. I very much appreciate the contributions you have made today, gentlemen.

Mr. TIBBETTS. Thank you.

Dr. LEVIN. Thank you.

Mr. BROWN. I understand that Dr. Levin and Dr. Edwards will remain here also for the next panel.

Dr. EDWARDS. Yes.

Dr. LEVIN. That's correct.

Mr. BROWN. Mr. Lloyd.

Mr. LLOYD [presiding]. As soon as the witnesses are seated, the hearing will continue.

Are we now ready, gentlemen? OK. Mr. Brown will return shortly. We have another rollcall. That is, he has one on another committee. We all have a similar problem trying to be in three places at once.

In continuing with the hearings today, we would like to welcome the second panel. We have kept a couple of members and have added

three new ones. We have Dr. Robert L. Fairman, who is with us, and Dr. Wilbert E. Cantey. You are a doctor?

Dr. CANTEY. It so happens that I am.

Mr. LLOYD. I just have names, so I am not sure of the titles.

We also have Mr. Stuart J. Evans, Dr. Levin, and Dr. Edwards. I would like to take this opportunity to welcome you and to thank you very much for coming here and giving your time. This is an extremely important area. It is one which will not attract the attention of the media. Great statements are being uttered all around this building. What we do and say here today may well point in the direction for the Nation in the years to come. So, don't feel because there are not bright lights and people are not standing and rushing around and over people, don't feel that we are not also serving a good cause. With that approach, I welcome you. We will commence. We will proceed at this time with the testimony.

Now, Dr. Fairman is first. We do, indeed, have your statement, which I will accept for the record. It is actually the statement of Dr. Cantey.

Dr. CANTEY. Yes.

Dr. FAIRMAN. Yes.

Mr. LLOYD. We will put Dr. Cantey's statement in the record, without objection.

Dr. CANTEY. Thank you.

Mr. LLOYD. If you wish to read it or paraphrase it, fine. Do anything that you wish with it. We will be glad to hear from you.

Dr. CANTEY. I will try to summarize the statement for the record.

Mr. LLOYD. Thank you.

Dr. CANTEY. It is a short statement. We can go through it rather quickly.

Mr. LLOYD. Fine.

STATEMENT OF DR. WILBERT E. CANTEY

Dr. CANTEY. I am Wilbert E. Cantey, Director of the Office of Small and Disadvantaged Business of the Department of Transportation.

With me is Dr. Robert Fairman, Deputy Assistant Secretary of Transportation for Administration; also Mr. Roger Martino, Director of our Procurement Division. We are pleased to be here today to discuss with you the Department's activities relating to small high technology business in the area of procurement and research and development, that is, R. & D.

I will begin my remarks by pointing out that the Department of Transportation's efforts in R. & D. are directed mainly at applied technology compared to what we believe to be high technology developments such as those that are done at the Department of Defense, NASA, NSF, and others. For that reason, where your areas of inquiry specify small high-technology firms, as such, we have read them to refer to all small R. & D. firms who do business with us.

In all of our contracting for procurement and for R. & D. we are governed by the Federal procurement regulations established by the General Services Administration.

For that reason, DOT and the other departments have only a limited ability to vary from the uniform set of regulations and prac-

tices. To that extent, once a firm has mastered the procurement regulations dealing with one department there should generally be only minor variations in dealing with the other departments.

In an effort to simplify procurement regulations, we are providing staff support to the Office of Procurement Policy in developing a uniform procurement system proposal to be submitted to Congress this fall. The proposal should provide the basis for reviewing the applicability of many regulations to the area of small business.

To maximize the opportunities for and participation of small R. & D. firms in contracting at DOT, when possible, the Department attempts to structure R. & D. projects into a series of smaller projects to be accomplished sequentially. In this way, small, specialized firms can compete for portions of projects likely to be within their capability. Further, we incrementally fund many contracts to allow continuity of effort.

The Department has an extensive outreach program to also publicize our direct procurement and grant program, and to obtain new sources of supply.

We participated in the four National Science Foundation small business conferences on Federal research and development held in Boston, Chicago, Los Angeles, and Atlanta over the past 2 years. We sent representatives to the Federal procurement conferences sponsored by Members of Congres held throughout the country.

We regularly attend business and trade shows and seminars to counsel small business on how to do business with the Department. Each of our procurement offices has a small and disadvantaged business specialist whose purpose is to help small businesses obtain information and guidance on doing business with the Department. We encourage managers of small businesses, when they are in the Washington, D.C. area, to present their capabilities at one meeting with the small business liaison representatives of our operating administrations. This meeting simplifies their marketing efforts by providing contact points with the Department and up to date information. We believe that these efforts are resulting in increased award to small businesses from our programs.

We assign small and disadvantaged business contracting goals to all of our contracting activities. In accordance with Public Law 95–507, we have worked with the Small Business Administration and have arrived at a goal of 33.6 percent of $504 million that is for small business awards in fiscal year 1980.

While this is not broken down to provide separate goals for R. & D., et cetera, it does put an upward pressure on the number and dollar amount of R. & D. contracts going to small business. At the end of this statement we have provided two tables. Table 1 shows the dollar amount of R. & D. contracts awarded to small business and table 11 shows the total dollar amount of R. & D. conducted by DOT.

The Office of Small and Disadvantaged Business organized the DOT Procurement Council made up of the chief procurement officers from each of the operating administrations in the Department. The Council meets periodically to work on common problems and concerns related to small and disadvantaged business.

We use small business set asides in our R. & D. where the contracting officer determines that there are adequate small business sources to use this technique. We plan to review the use of small business set asides

as an element of future procurement surveys performed at procurement offices around the country.

The Department has a $3 million university research program in the Research and Special Programs Administration. We publish an annual solicitation which lists a number of project areas where we encourage universities to submit project proposals and perhaps qualify for contracts.

While we have not set up a small business innovative research program similar to NSF's program, we are watching their program and some related legislative proposals to determine whether DOT should initiate a similar program.

From time to time, we receive proposals initiated and submitted to the Department by a prospective contractor without solicitation by the Government. The Department encourages prospective contractors to disclose to the Department, for purposes of evaluation, unique or novel ideas or concepts which they have originated, conceived or developed, and own, and which have application to the work of this Department.

However, it is normal practice for the Department to develop its own requirements, to solicit offers or bids and then to contract with the source that offers the best value.

Many unsolicited proposals do not, in fact, contain ideas or concepts which are proprietary to or owned by the submitter, and acceptance of proposals by the Department for evaluation does not imply a promise to pay, a recognition of novelty or originality, or any restriction on the use of information contained in it to which the Government would otherwise be entitled. Nor does the fact that a procurement follow receipt of or is based on an unsolicited proposals in and of itself justify sole source procurement. It is our policy to process and evaluate all unsolicited proposals as quickly as possible. Proposals are acknowledged as soon after receipt as possible, and submitters are advised promptly as to the ultimate disposition of their proposals.

The Department conducts some R. & D. directly. This work is conducted at the following locations:

There is the Technical Center, FAA, at Atlantic City, N.J.

There is the Mike Monroney Aeronautical Center, FAA, at Oklahoma City.

There is the Fire and Safety Test Detachment, Mobile, Ala.

There is the Research and Development Center, Groton, Conn.

There is the Transportation Test Center, Pueblo, Colo.

We have the Vehicle Research and Test Center, East Liberty, Ohio.

There is the Fairbank Highway Research Station, McLean, Va.

There is the Transportation System Center, Cambridge, Mass.

A considerable portion of this R. & D. involves testing and the use of DOT test facilities. A number of the activities contract out a significant portion of their assigned work. In fact, the entire operation and maintenance of the Transportation Test Center in Pueblo, Colo., is performed under contract.

The Department of Transportation has worked hard to involve small business in our procurement program. We believe our work has expanded the opportunities for small business at DOT and we are increasing our efforts in that direction.

That concludes my prepared remarks. Dr. Fairman and I will be pleased to answer any questions you may have.

[The prepared statement of Dr. Cantey follows:]

STATEMENT OF WILBERT E. CANTEY, DIRECTOR OF THE OFFICE OF SMALL AND DISADVANTAGED BUSINESS OF THE DEPARTMENT OF TRANSPORTATION, BEFORE THE HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY, SUBCOMMITTEE ON INVESTIGATION AND OVERSIGHT, AND SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY ON JUNE 12, 1980.

Mr. Chairmen and Members of the Subcommittees:

I am Wilbert E. Cantey, Director of the Office of Small and Disadvantaged Business of the Department of Transportation. With me is Dr. Robert Fairman, Deputy Assistant Secretary of Transportation for Administration. We are pleased to be here today to discuss with you the Department's activities relating to small high technology business in the area of procurement and research and development (R&D).

I will begin my remarks by pointing out that DOT's efforts in R&D are directed mainly at applied technology compared to what we believe to be high technology developments at the Department of Defense, NASA and others. For that reason where your areas of inquiry specify small high technology firms we have read them to refer to all small R&D firms.

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In an effort to simplify procurement regulations, we are providing staff support to the Office of Procurement Policy in developing a Uniform Procurement System Proposal to be submitted to Congress this fall. The proposal should provide the basis for reviewing the applicability of many regulations to the area of small business.

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area, to present their capabilities at one meeting with the small business liaison representatives of our operating administrations. This meeting simplifies their marketing efforts by providing contact points with the Department and up to date information. We believe that these efforts are resulting in increased awards to small businesses from our programs.

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- Fire and Safety Test Detachment (USCG), Mobile, AL
- Research and Development Center (USCG), Groton, CT
- Transportation Test Center (FRA), Pueblo, CO
- Vehicle Research and Test Center (NHTSA), East Liberty, OH
- Fairbank Highway Research Station (FHWA), McLean, VA
- Transportation System Center (RSPA), Cambridge, MA

A considerable portion of this R&D involves testing and the use of DOT test facilities. A number of the activities contract out a significant portion of their assigned work. In fact, the entire operation and maintenance of the Transportation Test Center in Pueblo, Colorado is performed under contract.

The Department of Transportation has worked hard to involve small business in our procurement program. We believe our work has expanded the opportunities for small business at DOT and we are increasing our efforts in that direction.

That concludes my prepared remarks. Dr. Fairman and I will be pleased to answer any questions you may have.

Department of Transportation
Conduct of Research and Development
by Small Business

FY 80 R&D Contract Awards (first half)

	award dollars	percentage of total
Small Business	$10,706,000	32.7%
Other than Small	$21,984,000	67.3%
	$32,690,000	

FY 79 R&D Contract Awards (Whole Year)

Small Business	$39,316,000	32.6%
Other than Small	$81,068,000	67.4%
	$120,384,000	

FY 78 R&D Contract Awards (Whole Year)

Small Business	$32,701,000	34.8%
Other than Small	$61,391,000	65.2%
	$94,092,000	

These figures are derived from the DOT Contract Information System.

TABLE I

DEPARTMENT OF TRANSPORTATION
CONDUCT OF RESEARCH AND DEVELOPMENT
(In Millions of Dollars)

Administration & Appropriation	FY 79 Actual	FY 80 Estimate	FY 81 Estimate
Office of the Secretary			
Transportation Planning, Research and Development	$11.7	$12.5	$13.0
U.S. Coast Guard			
Research, Development, Test and Evaluation	21.1	22.0	24.0
Federal Aviation Administration			
Research, Engineering & Development	81.0	78.1	85.0
Facilities, Engineering & Development	9.3	15.4	15.3
Operations	15.2	15.0	15.6
Subtotal	105.4	108.5	115.9
Federal Highways Administration			
Federal-Aid Highways	35.3	36.8	38.1
Highway Safety Research and Development	9.3	9.6	9.0
Motor Carrier Safety	.7	1.2	.8
Subtotal	45.3	47.6	47.9
National Highway Traffic Safety Administration			
Operation/Research	37.2	37.6	42.6
Trust Fund Share of Highway Safety Programs	15.1	17.2	19.9
Subtotal	52.3	54.8	62.5
Federal Railroad Administration			
Railroad Research & Development	44.2	48.4	45.9
Urban Mass Transportation Administration			
Urban Mass Transportation Fund	58.0	54.8	59.9
Research & Special Programs Administration			
Research and Special Programs	12.0	11.0	11.5
TOTAL	$350.1	$359.6	$380.6

TABLE II

Mr. BROWN. Thank you very much.

Dr. CANTEY. Thank you.

Mr. BROWN. Did you have a separate statement to make, Dr. Fairman?

Dr. FAIRMAN. I do not have one.

Mr. BROWN. Mr. Lloyd.

Mr. LLOYD. Will you yield?

Mr. BROWN. Yes.

Mr. LLOYD. I am not sure of the relationship here. Do you work together? Do you work for him or does he work for you?

Dr. FAIRMAN. I am Deputy Assistant Secretary for administration and procurement for the Department. Dr. Cantey is the Director of Small and Disadvantaged Business Utilization Office, which reports directly to the Secretary.

Mr. LLOYD. And you work directly for the Secretary?

Dr. FAIRMAN. Yes.

Mr. LLOYD. Thank you very much.

Dr. FAIRMAN. Yes, sir.

Mr. LLOYD. Thank you.

Mr. BROWN. Shall we go to Mr. Evans at this time. He is Director of Procurement for NASA.

Mr. EVANS. Thank you, Mr. Chairman.

With your consent, I would like to summarize my statement at this time.

Mr. BROWN. Yes.

Mr. EVANS. I request that my statement be included in the record.

Mr. BROWN. The full text of your statement will be included without objection.

Mr. EVANS. Thank you.

Mr. BROWN. Please proceed.

STATEMENT OF STUART J. EVANS

Mr. EVANS. We thank you for your invitation to appear today to discuss further the policies, positions, and the actions that NASA has taken in connection with the utilization of high-technology small business firms.

In response to your invitation, I have with me today, behind me, Mr. Kenneth J. Kier, Director of our Small Business and Disadvantaged Utilization Office. Mr. Kier and I work intimately together. We both report to the Administrator of NASA, Dr. Frosch.

In our testimony of November 1, 1979, before this committee, as well as the joint committees of House and Senate on small business, we discussed in some detail many of the things that NASA is doing to increase the involvement of small high-technology firms in our aeronautics and space work. I shall not include that testimony or subject matter in what I have to say today. I will focus on the questions that you asked us and that you addressed in your invitation.

In recognizing the special capabilities that reside in small, high-technology firms, NASA expends considerable effort in the development and utilization of its source information files, and in effecting the broadest dissemination of procurement opportunities. NASA

issues advance information in the form of "letters of interest" and uses the "R. & D. Sources Sought" procedure in the Commerce Business Daily extensively, as well as reference to the Small Business Administration's PASS system to ascertain small business capabilities and maximize set-aside procurement opportunities. The extensive distribution and awareness of the research and technology objectives and plans, RTOP, manual has also proven to be an effective means for communicating NASA's research and technology interests to small firms. This is a manual that we put out annually. In addition, small firms are invited to participate in flight research experiments, announcement of opportunities, in areas of their demonstrated expertise. Small, high-technology firms are also included in the distribution of information concerning areas of specific research interest to NASA, which oftentimes leads to fruitful unsolicited proposals. This latter information is very widely distributed in what are known as "Dear Colleagues" letters. Both types of notices are also announced in the Commerce Business Daily.

In fiscal year 1979, R. & D. awards to small business totaled $205.6 million, which was 6.6 percent of the agency's total R. & D. awards to business firms. This is an increase of 13.4 percent in such awards from fiscal year 1978. We estimate that fiscal year 1980 small business R. & D. awards will total about $240 million. This would be a further increase of 17 percent over the achievement of the previous year.

It is noteworthy that the value of NASA's R. & D. awards to small firms has increased appreciably each year, though the corresponding increase in total R. & D. awards has been almost entirely related to funding actions on previously awarded contracts to large business firms, primarily for the Space Shuttle program. Should we eliminate from the fiscal year 1979 funding on the six major Shuttle contracts, the small business share of total R. & D. awards would increase from 6.6 to 10.8 percent. It would have been close to 11 percent. Furthermore, when we consider and remove the funding actions in 1979 on multiyear R. & D. contracts which are of an ongoing nature, each in excess of $10 million, the small business share increases to about 30 percent.

In the matter of regulation simplification, NASA has had little opportunity to effect meaningful changes in its procurement regulations on behalf of small business. These regulations are developed primarily to implement statutes, Executive orders or similar requirements imposed by other departments and agencies in connection with their responsibilities. In fact, we made an extensive review of the regulations that go into contracts not too long ago in an attempt to make changes. This was not particularly productive because of the nature of the revisions that we were examining, in that they were beyond our authority and control to effect.

In the matter of unsolicited proposals, we believe that these are especially important to achieve innovation through the Government's procurement process. It provides an established means whereby new ideas can be presented and properly considered in a systematic way. In fiscal year 1979, of the 231 NASA contract awards resulting from unsolicited proposals, 79 were awarded to small business firms. This represents 34 percent of all such awards to industry and nonprofit

organizations, and 32 percent of the total dollars involved. In my full statement, I have attached a detailed breakdown of these numbers. It is also pertinent that, in recent years, one of every four unsolicited proposals submitted by small business concerns have been accepted and funded.

From its inception, NASA was founded on the principle of reliance upon the private sector for the performance of the missions assigned to it. It is because of this reliance that between 82 and 84 percent of our total appropriated funds flow in one manner or another to the private sector through the procurement process. In the specific case of supporting research and technology funds, through which much of our basic research is conducted, two-thirds of the money appropriated for this purpose flows to the private sector as direct awards. For example, in fiscal year 1979, $249.2 million of a total amount of $371.4 million was applied in the private sector. Of the remaining $122.2 million, allocated to our research centers, the majority of this was for the operation and maintenance of basic facilities such as wind tunnels, engine test stands, and the like. Even in this instance, most of that money allocated to the centers flowed to the private sector in the form of support service and maintenance contracts to operate these facilities at the time. Thus, very little, if any research, conducted in NASA laboratories is in direct competition with small, high-technology firms.

We have been familiar with the National Science Foundation's (NSF) small business innovations research program, SBIR, for several years, and carefully assessed its relevance to our mission. We have also had several discussions with the NSF about this.

As a result of the assessment that we have made, in 1979 we instituted a program which, in some ways, may be similar to the NSF's SBIR program. This initiative, which is specifically designed to stimulate the involvement of small, high technology firms in NASA's mainline research and technology work, is discussed earlier in this testimony. We perceive the NSF-phased program as being, essentially, a technology transfer program, which subsidizes, through grants, the feasibility and principal research effort toward the development of products and services for commercial application.

While this program is undoubtedly well suited to the mission of that agency, we do not believe that it is readily transferable to NASA, or similar R. & D. agencies. We suggest that NASA's concept is more in consonanee with its basic charter, and prescribed mission, in that the small business stimulus is accomplished in direct support of NASA program and project requirements.

Again, Mr. Chairman, I appreciate the opportunity to be here and partieipate. Thank you. We will be pleased to answer questions of the subcommittee.

[The prepared statement of Mr. Evans follows:]

STATEMENT OF
STUART J. EVANS
DIRECTOR OF PROCUREMENT
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BEFORE THE
SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT AND
THE SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY,
COMMITTEE ON SCIENCE AND TECHNOLOGY
US HOUSE OF REPRESENTATIVES

JUNE 12, 1980

Mr. Chairmen and members of the Subcommittees. NASA appreciates the opportunity you have afforded us to appear today to discuss further the Agency's policies, actions and views on opportunities for small, high technology firms in NASA's aeronautics and space programs.

In response to your invitation of May 19, 1980, I have with me today Mr. Kenneth J. Kier, NASA's Director of Small and Disadvantaged Business Utilization.

In our testimony of November 1, 1979, before the House Committee on Science and Technology, and the Small Business Committees of the House and Senate, in joint session, we discussed in some detail many of the things that NASA is doing to increase the involvement of small, high technology firms in NASA's work. So as not to burden the record, we will not repeat the testimony, but will merely summarize relevant aspects, as we focus on the matters you have requssted we address at this time.

NASA relies extensively on the support of the private sector for the accomplishment of its work. Each year more than 80% of the entire NASA budget is placed in the form of grants and contract awards with the educational, scientific and business communities; more than 90% of this procurement effort is for research and development activities.

In recognition of the special capabilities that reside in small, high technology firms, NASA expends considerable effort in the development and utilization of its source information files, and in effecting the broadest dissemination of procurement opportunities. In this regard, NASA issues advance information in the form of "letters of interest" and uses the "R&D Sources Sought" procedure in the Commerce Business Daily extensively, as well as reference to the Small Business Administration's PASS System to ascertain small business capabilities and maximize set-aside procurement opportunities. The extensive distribution and awareness of the Research and Technology Objectives and Plans (RTOP) manual has also proven to be an effective means for communicating NASA's research and technology interests to small firms. In addition, small firms are invited to participate in flight research experiments (Announcement of Opportunities), in areas of their demonstrated expertise. Small, high technology firms are also included in the distribution of information concerning areas of specific research interest to NASA, which often times leads to fruitful unsolicited proposals. This latter information is widely distributed in what are known as "Dear Colleague" letters. Both type notices are also announced in the Commerce Business Daily.

As discussed in our November 1, 1979 statement, in Fiscal Year 1979, in response to the "White House Conference on Small Business", NASA initiated a special effort directed specifically toward small, high technology firms. In this initiative, at least $10 million was to be reserved for procurement awards to small firms, in conjunction with NASA's supporting research and technology and early development activities. Each NASA installation was assigned a prorated share of the program dollars for the award of research contracts which may not otherwise have gone to small business. This is viewed as "seed money" to further avail to the agency the unique qualities and creativity that small R&D firms can contribute in broadening NASA's industrial support base, to promote economies and innovation through increased research competition, and to provide for small business involvement in future flight projects. In FY-1979 more than 200 individual contracts were awarded under this program, totalling approximately $12.5 million. This initiative is being continued in FY-1980, with similar results anticipated.

Appendix I reports NASA research and development awards to business firms for FY-1978 and FY-1979. In FY-1979, R&D awards to small business totalled $205.6 million, which was 6.6 percent of the agency's total R&D awards to business firms. This is an increase of 13.4 percent in such awards from FY-1978. We estimate that in FY-1980, small business R&D awards will total about $240 million. This would be a further increase of 17 percent over the achievement of the previous year.

It is noteworthy that the value of NASA's R&D awards to small firms has increased appreciably each year, though the corresponding increase in

total R&D awards has been almost entirely related to funding actions on previously awarded contracts to large business firms, primarily for the Space Shuttle program. Should we eliminate the FY-1979 funding on the six major shuttle contracts, the small business share of total R&D awards would increase from 6.6 to 10.8 percent. Similarly, if we were to remove the FY-1979 funding on all multi-year R&D contracts, each valued in excess of $10 million (which are generally beyond the capacity of small firms), the small business R&D share increases to about 30 percent.

In the matter of regulation simplification, NASA has little opportunity to effect meaningful changes in its procurement regulations in behalf of small business. These regulations are developed primarily to implement statutes, Executive Orders or similar requirements imposed by other departments and agencies in connection with their responsibilities. For example, the Office of Federal Procurement Policy seeks to impose consistency and uniformity in procurement policy; and the Department of Labor implements, through required contract clauses, equal employment opportunity programs, occupational, safety and health standards, and various kinds of minimum wage standards required by such laws as Davis Bacon Act, Service Contract Act and the Contract Work Hours and Safety Standards Act. An extensive NASA review of its regulations, to make such changes, has not been particularly productive, because the nature of the revisions posed are beyond NASA's authority and control to effect.

We note that Public Law 93-400, as amended by Public Law 96-83, assigns the overall responsibility for developing a system of simplified and uniform procurement policies regulations, procedures and forms to the OFPP. Furthermore, Public Law 95-507, in amending the Small Business

Act, reiterates this responsibility, and further directs that OFPP consult with the Small Business Administration (SBA), in ensuring that small business interests are properly considered. Therefore, Federal procurement agencies must look to this authority for such regulation revisions for the benefit of small business.

Although we have not been able to effect significant changes to the regulations, we have, and continue, a concerted effort to explain the process through the brochures Selling to NASA and How to Seek and Win NASA Contracts. Small Business Specialists at each installation are also readily available to respond directly and personally to small business inquiries.

Another matter you requested us to address was our method for handling unsolicited proposals. NASA's policy guidance and procedures for the submission and processing of unsolicited proposals are prescribed in Part 4, Subpart 9, of the NASA Procurement Regulation (Attachment II). This information is summarized in the brochure Selling to NASA and in the NASA Handbook, NHB 5100.3, A Guide to Policies and Procedures for Sponsored Research. This latter publication is currently being revised.

NASA encourages prior contact with the appropriate technical office prior to the submission of an unsolicited proposal. This is to ensure that the prospective proposer understands NASA areas of interest, and to preclude the expenditure of extensive resources in proposal development when the potential for acceptance is nonexistent. Proposals are to be submitted to the NASA installation with predominant interest in the

research. Here again, the RTOP manual is especially helpful in identifying areas of research interest, as well as the appropriate technical office involved. A Proposal Control Officer at each installation ensures that each proposal is properly processed and responded to in a timely manner.

We believe that unsolicited proposals are especially important to achieving innovation through the Government procurement process. It provides an established means whereby new ideas can be presented and properly considered in a systematic way. In FY-1979, of the 231 NASA contract awards resulting from unsolicited proposals, 79 were awarded to small business firms. This represents 34 percent of all such awards to industry and nonprofit organizations, and 32 percent of the total dollars involved. See Attachment II. It is also pertinent that, in recent years, 1 of every 4 unsolicited proposals submitted by small business concerns have been accepted and funded.

From its inception, NASA was founded on the principle of reliance upon the private sector for the performance of the missions assigned to it. It is because of this reliance that between 82 and 84 percent of our total appropriated funds flow in one manner or another to the private sector through the procurement process. In the specific case of Supporting Research and Technology funds, through which much of our basic research is conducted, two-thirds of the money appropriated for this purpose flows to the private sector as direct awards. For example, in FY-1979, $249.2 million of a total amount of $371.4 million were applied in the

private sector. Of the remaining $122.2 million, allocated to our research centers, the majority of this was for the operation and maintenance of basic facilities such as wind tunnels, engine test stands, and the like. Even in this instance, most of that money allocated to the Centers flowed to the private sector in the form of support service and maintenance contracts to operate these facilities. Thus, very little if any research conducted in NASA laboratories is in direct competition with small, high technology firms.

NASA has been familiar with the National Science Foundation's (NSF) Small Business Innovations Research program (SBIR), for several years, and carefully assessed its relevance to our mission. Dr. Jack T. Sanderson, NSF's Assistant Director for Engineering and Applied Science, befors the House Committee on Small Business on March 19, 1980, describes the program in the following terms.

> "The objective of the program is to use the NSF funds to conduct feasibility research on the innovative idea and as 'pre-venture' capital to attract follow-on private support. We are attempting to increase the number of small science and technology based firms capable of conducting R&D for the government and industry, and capable of developing innovative products and services. In addition, the program seeks to fund, on a highly competitive basis, creative, high-risk, potentially high pay-off research ideas. NSF sets the general topics for the research but provides the flexibility

for creative, innovative research within those guidelines.

The program involves three phases. Phase I provides awards of up to $25,000 for six months to demonstrate the feasibility of the research and the capabilities of the firm. This phase is open to any firm which meets the SBA definition of a small business. Phase I is also designed to reduce the time and cost to the firms of preparing formal research proposals.

Successful firms in Phase I of this program become eligible to submit Phase II proposals to carry out the principal research effort for up to 24 months. Funding in the second phase of the program depends upon the quality of the proposal and the firm's ability to obtain follow-on private funding from a third party to pursue development toward commercial use. In short, federal funding pays for research in selected topic areas in Phases I and II, and private funding pays for subsequent work toward commercial use. Phase III is the development phase in which commercial objectives are pursued from the same research base but with private capital.

An important aspect of the program is its focus on technology transfer. Small businesses are encouraged to involve university scientists and engineers as consultants where appropriate. Large firms have shown considerable interest in providing

both phase III funding to the small firm and a royalty agreement for any resulting sales in return for the right to license or acquire the technology.

NSF is effectively providing 'pre-venture' capital at the time of highest risk and greatest difficulty in obtaining initial funding of innovative ideas. In addition to this, NSF seeks to protect the proprietary rights of the participants. Patent rights are necessary if follow-on venture capital is to be obtained. The government retains 'march-in' rights if the patent is not exercised within a reasonable period of time and the right to use the patent for its own purposes."

In FY-1979, NASA instituted a program which in some ways may be similar to NSF's SBIR program. This initiative, which is specifically designed to stimulate the involvement of small, high technology firms in NASA's mainline research and technology work, is discussed earlier in this testimony. We perceive the NSF phased program as being, essentially, a technology transfer program, which subsidizes, through grants, the feasibility and principal research effort toward the development of products and services for commercial application.

While NSF's program is undoubtedly well suited to the mission of that agency, we do not believe that it is readily transferable to NASA, or similar R&D agencies. We suggest that NASA's concept is more in consonance with its basic charter, and prescribed mission, in that the small business stimulus is accomplished in direct support of NASA program and project requirements.

Thank you for the opportunity of presenting NASA's views on these important matters. We will be pleased to answer any questions that the Subcommittees may have.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SMALL AND DISADVANTAGED BUSINESS UTILIZATION PROGRAM
RESEARCH AND DEVELOPMENT AWARDS

Fiscal Year 1979

	R&D
Total NASA Business	$3,131,572
Small Business	206,544
% of Total Business	6.6%
Set-Asides	49,407
% of Total Business	1.6%
% of Small Business	23.9%

Fiscal Year 1978

	R&D
Total NASA Business	$2,668,340
Small Business	181,326
% of Total Business	6.8%
Set-Asides	45,417
% of Total Business	1.7%
% of Small Business	25.0%

NOTE: All data include awards made under Section 8(a) authority of the Small Business Act.

DOLLARS IN THOUSANDS

Subpart 9-Unsolicited Proposals

4.900 Scope of Subpart. This Subpart sets forth policies and procedures concerning the receipt, evaluation, and acceptance of unsolicited proposals.

4.901 General. The unsolicited proposal is a valuable means by which unique or innovative methods or approaches which have originated or developed outside the Government can be made available to Government agencies for use in the accomplishment of their missions. It is offered in the hope that the Government will enter into a contract or other agreement with the offeror for (i) research on or development of, the methods, approaches, or ideas it contains, or (ii) the conduct of the activity or services or the delivery of the items it proposes. It should not be merely an advance proposal for a specific agency requirement which would normally be procured by competitive methods. An unsolicited proposal should be prepared independent of Government supervision. It often represents a substantial investment of time and effort by the offeror. It should present the proposed work in sufficient detail to allow a determination that Government support could be worthwhile and that the proposed work could enhance, benefit, and/or provide valuable input to an agency's research and development mission or to some other area of agency responsibility.

4.902 Policy. It is the policy of the Government to foster and encourage the submission of unsolicited proposals.

4.903 Agency Program Direction and Operation. NASA will foster and encourage the submission of unsolicited proposals relevant to Agency mission requirements by:

(a) informing organizations and individuals of the scientific and technological areas encompassed by NASA's mission;

(b) issuing notices to the scientific and technological communities which are informative of on-going programs and areas of activity;

(c) making no other use of proposals than for evaluation or review purposes unless otherwise specified by law;

(d) developing appropriate policies and procedures, consistent with this subpart 9, which not only encourage unsolicited proposal submission, but which avoid to the extent possible those factors which tend to discourage the generation and acceptance of innovative ideas by the unsolicited proposal mechanism;

(e) ensuring the availability of information for the preparation and submission of unsolicited proposals to NASA;

(f) maintaining uniform proposal submission requirements throughout NASA which place the least possible burden on the offeror; and

(g) acknowledging proposals, making suitable evaluations, and notifying the offeror of NASA's decisions in a timely fashion.

4.904 Definitions. As used in this Subpart 9, the following terms have the meanings stated.

(a) "Unsolicited proposal" means a written offer to perform a proposed task or effort, initiated and submitted to the

Government by a prospective contractor (offeror) without a solicitation by the Government with the objective of obtaining a contract or other agreement. Advertising material, commercial product offerings, contributions, or technical correspondence as defined in paragraphs (b) through (e) below which are submitted to an agency shall not be considered to constitute unsolicited proposals within the intent of this Subpart 9.

(b) "Advertising material" means material designed to acquaint the Government with a prospective contractor's present off-the-shelf products or potential capabilities, or designed to determine the Government's interest in buying such products.

(c) "Commercial product offering" means offers of standard commercial products usually sold in substantial quantities to the general public and which the vendor wishes to see introduced in the Government's supply system as an alternate or replacement for an existing supply item.

(d) "Contribution" means concepts, suggestions, or merely ideas presented to the Government for its use, with no indication on the part of the offeror that he will devote any further effort in relation to such concepts, suggestions, or ideas on behalf of the Government.

(e) "Technical correspondence" includes written inquiries regarding Government interest in research areas, preproposal explorations, technical inquiries, and research descriptions.

4.905 Advance Guidance. Organizations or individuals who are interested in submitting an unsolicited proposal should be encouraged, before expending extensive effort in preparing a detailed unsolicited proposal or submitting any proprietary information to the Government, to make preliminary inquiries as to the general need for the type of effort contemplated.

(a) Prior contact with agency technical personnel is permissible and should be encouraged with the limited objectives of conveying to the prospective offeror an understanding of the agency mission and needs relative to the type of effort contemplated.

(b) NASA shall make free written information available to potential offerors regarding policies and procedures for unsolicited proposals. As a minimum, the following information shall be made available to potential offerors:

(i) definition of an unsolicited proposal, consistent with that set forth in 4.904;

(ii) characteristics of a suitable proposal acceptable for formal evaluation, (also see 4.906 and 4.910);

(iii) requirements concerning responsible prospective contractors (see 1.900), organizational conflicts of interest, and where applicable, cost sharing (see 1.362);

(iv) the role of technical correspondence prior to proposal preparation;

(v) agency points of contact for information regarding advertising, contributions, bidders mailing lists, and other

types of transactions frequently misconstrued as unsolicited proposals;

(vi) information regarding unsolicited proposal submission procedures;

(vii) information regarding evaluation procedures of NASA;

(viii) sources of information on NASA objectives and areas of potential interest suitable for unsolicited proposal submissions;

(ix) information regarding NASA's policy for treating technical, commercial, and financial data contained in unsolicited proposals and the notice to be used by an offeror to protect any trade secrets contained in a proposal (see 1.304-2); and

(x) advice to the prospective offeror that an unsolicited proposal shall conform to NASA's procedural and submission guidelines.

(c) Personal contacts shall be conducted in a manner that will preclude agency commitments regarding acceptance of unsolicited proposals.

4.906 Content of Unsolicited Proposals. Unsolicited proposals should contain the following information in order to permit consideration in an objective and timely manner.

(a) Basic Information. This includes:

(i) the name and address of the offeror (if an organization, indicate type, e.g., profit, nonprofit, educational, small business);

(ii) names and telephone numbers of the offeror's technical and business personnel who may be contacted by the agency for evaluation or negotiation purposes;

(iii) application of the notice of 1.304-2(d)(2) to any information in the proposal which the offeror desires to protect as a trade secret;

(iv) names of any other Federal, State, local agencies, or other parties receiving the proposal and/or funding the proposed effort or activity;

(v) date of submission; and

(vi) signature of a responsible official or authorized representative of the organization or a person authorized to contractually obligate the organization.

(b) Technical Information. This includes:

(i) a concise title and an abstract (approximately 200 words) of the proposed effort;

(ii) a reasonably complete discussion stating the objectives of the effort or activity, the method or approach and extent of effort to be employed, the nature and extent of the anticipated results, and the manner in which the work will help to support accomplishment of NASA's mission;

(iii) the name and brief biographical information of the offeror's key personnel (including alternates, if desired) who would be involved; and

(iv) the type of support, if any, the offeror requests of the agency, e.g., facilities, equipment, materials, or personnel resources.

(c) Supporting Information. This includes:

(i) a proposed price or total estimated cost;

(ii) a cost estimate for the proposed effort sufficiently detailed by element of cost for meaningful evaluation;

(iii) the type of contract preferred;

(iv) period of time for which the proposal is valid (a minimum of six months is suggested);

(v) proposed duration of effort;

(vi) statements, if applicable, regarding cost sharing organizational conflicts of interest, security clearance status, and environmental impacts and brief descriptions of the organization, previous work or experience in the field of the proposal, and facilities to be utilized for the work, where appropriate for understanding the proposal; and

(vii) The identifying number of the basic contract or other agreement (if applicable).

(d) Renewal Information. Proposals for renewal of on-going projects are generally simpler to prepare. However, they should cover parts (a) - (c) above, particularly as dictated by changes since the original award was made. Prior contact with the NASA technical officer is advisable to determine the optimum amount of technical information to include.

4.907 Time of Submission. Unsolicited proposals should be submitted well in advance of the offeror's desired beginning of the proposed effort or activity in order to allow the agency sufficient time to evaluate the proposal and negotiate any resultant contract, or other agreement, and in ample copies to allow simultaneous study by all reviewers. A minimum of 5 copies and of four months advance submission are suggested.

4.908 NASA Points of Contact.

(a) Coordinating Offices. Each NASA field installation will designate an organizational entity as its unsolicited proposal control unit for coordinating the handling of unsolicited proposals in accordance with policies and procedures herein (see 4.909). Headquarters program offices are designated as coordinating offices for proposals sent directly to them in relation to disseminated information on continuing activities described in (b)(i) below.

(b) Proposal Submission.

(i) Headquarters offices broadly disseminating information within the scientific and technological communities regarding continuing responsibilities and areas of activity should indicate in the communications that unsolicited proposals relating to such continuing responsibilities and areas of activities should be submitted directly to the originating office, unless submission to a specific field installation is indicated. Responses to any such field installation

announcements shall be addressed to the unsolicited proposal control unit at that installation.

(ii) Except as provided in (i), unsolicited proposals believed to be of interest to only one NASA field installation should be submitted to that installation marked for attention of the unsolicited proposal control unit.

(iii) Except as provided in (i), unsolicited proposals believed to be of interest to NASA Headquarters are to be submitted to NASA Headquarters, University Affairs Office, Code LU-16, Unsolicited Proposal Control Unit, Washington, DC 20546.

(iv) Except as provided in (i), proposals from colleges and universities which are believed to be of interest to more than one installation should be submitted to NASA Headquarters, University Affairs Office, Code LU-16, Unsolicited Proposal Control Unit, Washington, DC 20546, whereas such proposals from non-educational and other non-profit organizations should be submitted to each installation believed to have an interest, to the attention of the unsolicited proposal control unit.

(c) Proposal Preparation Information. Information on the preparation of unsolicited proposals may be obtained from field installation procurement offices or NASA Headquarters. Only inquiries from academic researchers should be sent to the Headquarters University Affairs Office. All other inquiries to NASA Headquarters should be addressed to Headquarters Contracts and Grants Division, Code HW-2, Washington, D.C. 20546.

(d) Other Inquiries (See. 4.904).

(i) Advertising material and commercial product offerings may be forwarded to any NASA office or individual.

(ii) Contributions should be sent to Director of the Staff, Inventions and Contributions Board, National Aeronautics and Space Administration, Washington, D.C. 20546.

(iii) Technical Correspondence. NASA does not have an "Informal" or "preliminary" proposal category. Hence, any inquiries or exploratory discussions prior to submission of a complete unsolicited proposal is left as a matter strictly between the interested individuals or organization and the appropriate NASA office or employee. General guidance on whom to contact is available from the procurement office at each field installation and NASA Headquarters.

4.909 Receipt, Review, and Evaluation. Each NASA field installation shall adopt procedures that provide for the coordination, control, receipt, and evaluation of proposals in accordance with agency-wide policies and procedures. Because of the sensitivity of the evaluation process, evaluations should be conducted in a manner that will ensure thorough and equitable reviews which are in the best interests of NASA and the offeror.

(a) Unsolicited proposals shall be acknowledged as soon as possible by the office which has been assigned the coordination responsiblity (see 4.908), and processed in an expeditious manner.

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(b) Prior to making a comprehensive evaluation of an unsolicited proposal, the coordinating office (see 4.908) shall determine that the document: (i) contains sufficient technical and cost information to permit a meaningful evaluation; and (ii) has been approved by a responsible official or authorized representative of the organization submitting the proposal, or a person authorized to contractually obligate the organization.

(c) If the document does not meet the requirements in paragraph (b) above, the offeror shall be given the opportunity to provide the required data. A comprehensive evaluation of an unsolicited proposal need not be made if the proposal is not within the purview of NASA's mission (also see 4.912(a)). In such cases, the submitter shall be furnished a prompt reply, stating how the document is being interpreted by NASA, the reason(s) for not evaluating it, and the disposition or intended disposition of the matter submitted. NASA shall not deny reconsideration of a timely and appropriately revised submission which is responsive to such an initial determination.

(d) Comprehensive evaluations shall be coordinated by the organizational entity designated in accordance with 4.908. Each unsolicited proposal that is circulated for a comprehensive evaluation within the agency shall have attached the NASA cover sheet prescribed in 1.304-2(d)(4)(B). The policy and procedures set forth in 1.304-2(d)(5) must be followed in the event it is necessary to disclose an unsolicited proposal outside the Government in order to obtain a NASA evaluation. In evaluating an unsolicited proposal, agency personnel shall consider in addition to any other criteria, the following:

(i) unique, innovative, or meritorious methods, approaches, or ideas which have originated with or assembled together by the offeror that are contained in the proposed effort or activity;

(ii) overall scientific, technical, or socio-economic merits of the proposed effort or activity;

(iii) potential contribution which the proposed effort is expected to make to the agency's specific mission, if pursued at this time;

(iv) capabilities, related experience, facilities, or techniques, or unique combinations thereof which the offeror possesses and offers, and which are considered to be integral factors for achieving the scientific, technical, or socio-economic objective(s) of the proposal; and

(v) qualifications, capabilities, and experience of the proposed principal investigator, team leader, or key personnel who are considered to be critical in achieving the objectives of the proposal.

(e) Upon completion of the comprehensive evaluation of an unsolicited proposal, evaluators shall, in accordance with NASA procedures, notify the coordinating office (see 4.908) of their conclusions together with recommendations for further action. The manner and extent of the evaluation of the scientific/technical and price/cost portions of unsolicited

proposals is the responsibility of offices having substantive responsibilities for those areas.

4.910 Method of Procurement.

(a) A favorable comprehensive evaluation of an unsolicited proposal is not in itself, sufficient justification for negotiating on a noncompetitive basis with the offeror. When a document qualifies as an unsolicited proposal (see 4.904(a) and 4.909(b)) but the substance (i) is available to the Government without restriction from another source, or (ii) closely resembles that of a pending competitive solicitation, or (iii) is otherwise not sufficiently unique to jusitfy acceptance (see 4.909(b)), the unsolicited proposal shall not be acceptable. When procurement is intended and competition is feasible, the proposal shall be returned to the offeror together with the reasons for the return (see 4.909(e)).

(b) A negotiated, noncompetitive procurement is permissible when an unsolicited proposal has received a favorable technical evaluation, unless it is determined that the substance thereof is available to the Government without restriction from another source, or a competitive procurement is otherwise appropriate. The technical office sponsoring the procurement shall support its recommendation with a justification for acceptance of unsolicited proposal. The justification shall be based on a comprehensive evaluation of the proposal. The justification shall include the facts and circumstances that operate to preclude competition and that support the recommended noncompetitive action. Consideration shall include the evaluation factors listed in 4.909 (d)(i-v).

(c) When it is determined that the subject matter of an unsolicited proposal is acceptable for award on a noncompetitive basis, the unsolicited proposal will serve as the basis for negotiation.

4.911 Prohibitions. NASA shall not permit all or any part of an unsolicited proposal to be used as the basis, or portion of, a solicitation, or in negotiation with other organizations unless the offeror is notified of and agrees to the intended use. However, nothing herein precludes the Government from using any data, concept or idea which it could have used had the unsolicited proposal not been submitted. With respect to data (see 4.913(a)) tendered in an unsolicited proposal, disclosure of information which concerns or relates to trade secrets, processes, operations, style of work, or apparatus, and other matters may result in the imposition of a criminal penalty pursuant to the provisions of 18 U.S.C. 1905.

4.912 Interagency Coordination. When it is determined that a meritorious unsolicited proposal is not related to the mission of NASA or may be of interest to agencies in addition to NASA, NASA may identify for the offeror other agencies whose missions bear a relationship to the subject matter of the unsolicited proposal; however, NASA should not transfer responsibility for

evaluation to another agency without the express consent of the offeror.

(a) NASA will not accept for formal evaluation unsolicited proposals initially submitted to another agency, or JPL, without the express consent of the offeror.

(b) Proposals submitted to NASA may not be transferred to JPL for procurement without the offeror's permission.

4.913 Limited Use of Data.

(a) As provided in 1.304-2, it is NASA policy to use information contained in an unsolicited proposal for evaluation purposes only. Should any of such information comprise a trade secret of the offeror, or his proposed subcontractor, and it is desired to maintain trade secret rights in the information, the notice of 1.304-2(d)(2) must be affixed to the cover sheet of the proposal when submitted specifying therein the pages of the proposal which contain the trade secret. Thereafter, it is NASA policy to protect such noticed information (data) as a trade secret. The notice in 1.304-2(d)(2) is as follows:

NOTICE

Data on pages --- of this proposal constitute a trade secret. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed other than for evaluation purposes; provided however, in the event a contract is awarded on this proposal the Government may obtain in the contract additional rights to use and disclose this data.

(b) If the contracting officer receives an unsolicited proposal containing a notice, the terms of which are more restrictive than those provided in the notice in (a) above, the contracting officer shall inquire whether the offeror is willing to accept the conditions of the "Notice" in (a) above. Should the offeror not agree, local counsel should be consulted concerning the legal effect of the more restrictive conditions imposed by the offeror.

4.914 Foreign Proposals. Proposals from Foreign sources are additionally subject to the provisions of NPD 1362.1B, "Initiation and Development of International Participation and Cooperation in Aeronautical and Space Programs." Field Installations will forward purchase requests for foreign proposals to the Headquarters Contracts Division, Code HW-2, through the International Programs Division, Code LI, for procurement action.

4.915 University Proposals. The University Affairs Office will issue appropriate supplementary policies and procedures for internal NASA handling of unsolicited proposals submitted by colleges and universities, in accordance with applicable provisions of NMI 1103.18.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
NEW RESEARCH CONTRACT AWARDS
RESULTING FROM UNSOLICITED PROPOSALS

FY 1979

	Number of Awards	% of Number	Amount	% of Amount
Total Awards	231	100	$11,329,725	100
Large Business	61	27	3,688,715	33
Small Business	79	34	3,641,603	32
Universities	63	27	2,485,118	22
Nonprofit	28	12	1,514,289	13

FY 1978

	Number of Awards	% of Number	Amount	% of Amount
Total Awards	156	100	$12,670,218	100
Large Business	52	33	2,921,431	23
Small Business	41	26	5,786,714	45
Universities	45	29	2,868,042	23
Nonprofit	18	12	1,094,031	9

FY 1977

	Number of Awards	% of Number	Amount	% of Amount
Total Awards	129	100	$ 7,771,666	100
Large Business	42	32	3,028,883	39
Small Business	32	25	1,224,826	16
Universities	37	29	2,015,459	26
Nonprofit	18	14	1,502,498	19

FY 1976

	Number of Awards	% of Number	Amount	% of Amount
Total Awards	148	100	$ 7,595,135	100
Large Business	67	45	3,865,292	51
Small Business	34	23	1,292,509	17
Universities	29	20	1,387,502	18
Nonprofit	18	12	1,049,832	14

Excludes Grants, Intragovernmental, Cooperative Agreements

Mr. BROWN. Thank you for that excellent review and statement.

Mr. EVANS. Yes, sir.

Mr. BROWN. We are confronted at this time with the need for another recess.

Mr. EVANS. Yes.

Mr. BROWN. I think it would be best if we broke at this point and returned as quickly as possible. I would ask you to remain here for a few minutes.

Mr. EVANS. Yes.

Dr. CANTEY. Yes.

Mr. BROWN. The subcommittee will be in recess. We will return as quickly as possible. We will ask you gentleman to remain here, if you will.

[Short recess taken.]

Mr. BROWN. The subcommittee will again be in order. We resume our hearing.

We have had presentations from NASA and the Department of Transportation with regard to the small, high-technology initiatives.

I would like to ask Dr. Edwards and Dr. Levin to offer any questions or comments that would explore the effectiveness of these programs in bringing about a greater involvement of the small business community in these activities. Do you gentlemen have any comments to offer at this point?

Dr. EDWARDS. Yes, Mr. Chairman.

Mr. BROWN. Dr. Edwards.

Dr. EDWARDS. This would be addressed to the DOT.

Mr. BROWN. Yes.

Dr. EDWARDS. I'm curious about what DOT's advancement priorities might be and how you advance your priorities. For example, safety, is it most important? And convenience. There must be a series of priorities that you assign to the things that you do as an agency. I am just curious at this time as to what they might be. I am sure they must be published some place.

Dr. FAIRMAN. We have a number of processes that we use to identify what our priorities would be. They are expressed in terms of what we finally go with in the budget, and that kind of thing. We have got a Secretary's priority list which we identified. A large number of items in order of what the Secretary and the various administrations see in their priority programs. Certainly, safety is one of the high priority items. However, that is not very meaningful to say in itself. So, what we want to do is to identify this. Are we talking about automobile safety or airbags, or what are the specific items?

Dr. EDWARDS. Yes.

Dr. FAIRMAN. We do prioritize those. We set target dates and program priorities. They are updated about every month and reviewed in depth once a year prior to the development of the budget. We have a preview or a process in which all of the administration and the secretarial office and Deputy Secretary go through in which we review what are going to be our priority items for that particular budget year; also the resources that we are going to need and what it is that we have to do.

Dr. EDWARDS. Are those available publicly through the issuance of documents from DOT?

Dr. FAIRMAN. We put out a number of those; yes.

The transportation policy is one of the things that we put out that identifies it.

Dr. EDWARDS. Transportation policy?

Dr. FAIRMAN. Yes.

Dr. EDWARDS. Would those documents be of any value to a small business as to the generation of unsolicited proposals, Dr. Fairman?

Dr. FAIRMAN. They might. We have not really emphasized the unsolicited proposal matter. That was one of your questions. We spoke about that here.

Dr. EDWARDS. Yes.

Dr. FAIRMAN. Some of our work, and I guess I would like to amplify on Dr. Cantey's testimony is high technology work. However, we don't do basic research. Really, our research is not that. That is an important point. So, while we don't reject unsolicited proposals, we do not make a particular effort to gather unsolicited proposals, even in the university research program. We ask for responses in specific areas that we have identified.

Dr. EDWARDS. That you identified?

Dr. FAIRMAN. Yes.

Dr. EDWARDS. You do identify areas. You do ask for help in those areas?

Dr. FAIRMAN. Right.

Dr. EDWARDS. How would a person find that out, as to what it is that you are asking for?

Dr. FAIRMAN. How?

Dr. EDWARDS. Yes.

Dr. FAIRMAN. There are a number of ways that we do that. One is that we use the Commerce Business Daily. We do have, or participate, in the congressionally sponsored Federal procurement conferences that are managed by the Department of Commerce. We average about 30 to 35 of those a year. We have got about 57 procurement offices in the field. Each one of those has an individual, or one or more individuals, who are responsible for the small business operation. That's another way. We also put out a couple of publications, and I believe I have got them here. One is "Contracting With the Department of Transportation," and the other is "Minority Business Opportunities." In fact, it is also small business opportunities.

Actually, let me make one additional point.

Dr. EDWARDS. Yes.

Dr. FAIRMAN. Our R. & D. program is about $350 million for the Department. It is not really large in comparison with some of the other departments. In fiscal year 1979, we spent about $120 million contracting and about one-third of that amount went to small businesses. The reason that we got such a high percentage is that the kinds of work that we do blends itself to the response by small business. We are developing or having manufactured and built, in California, a couple of paratransit vehicles. All of the offers that we got initially on the conceptual phase of that development at the time was small business.

We have other examples. I hope that answers the question.

Dr. EDWARDS. Thank you.

Dr. FAIRMAN. Yes.

Dr. EDWARDS. Thank you, Mr. Chairman.

Mr. BROWN. Dr. Levin.

Dr. LEVIN. I have a problem of a general nature with the small businesses that I would like to address to the procurement people.

Mr. BROWN. Yes.

Dr. LEVIN. I hope that there is a ready answer, Mr. Chairman.

Mr. BROWN. Go ahead.

Dr. LEVIN. A lot of times a small company comes in with an idea that may be ahead of its time. It will come in with an unsolicited proposal. To make it a little more concrete, I will cite a few. One has to do with NASA. NASA, certainly, has provided an excellent opportunity for our company, but I am using this to illustrate the point.

We were the first company to suggest the use of satellites for monitoring air and water pollution. We went around to see if we could get other agency support that NASA said was required before NASA would commit. The other agencies did not see the necessity for satellites. We failed. Pollution sensing from satellites is a very big business now. We are not in it. Somehow we missed being able to succeed with this new idea.

When the Clean Water Act was passed, we submitted an unsolicited proposal to the EPA, in which we pointed out that we were about to spend tens of billions of dollars on concrete and steel which will commit the Nation on its present course for the collection and treatment of sewage for, probably, two or three generations to come. Now, before doing that, shouldn't we examine the whole fundamental question of the use of waterborne systems for sewage collection? We produce clear water. Then we put sewage in it. Next, we spend a lot of money taking the sewage back out. Maybe, there is a better system, or, maybe, we are missing out on something by continuing ancient Roman technology. This proposal was denied. I went downtown at the time and had a hearing before the Director of R. & D. I argued that we need new, better, and cheaper techniques. Isn't there some way, I asked, that we can collect and treat sewage without contaminating drinking water? It was explained to me that the study I proposed was not within the scope of things for which funding was provided. We lost out. We are not doing work we should be doing.

To get back to the concrete and steel part of the program, I attended a meeting in Annapolis last week in which there was a combined effort by the State of Maryland and the EPA to engender "innovative technology." It turns out that we have now spent these billions of dollars on the old technology and, in many instances, it isn't working.

We went to another part of the same agency. We said that we think that there could be a pollution problem for automobiles other than that from the exhaust. Brake linings and clutches are made of asbestos. We may be depositing large quantities of asbestos from these mechanisms in our streets and confined inhabited areas.

This idea was rejected on two bases: First, we were a small company. In those days the Government, or the agency, wasn't going to do R. & D. business with a small company. This was because "only the large aerospace companies had the necessary capabilities."

Second, "Get lost. We have enough troubles with the exhaust problems. We don't want to hear about the other problems with the automobile."

Now, here we see the problem surfacing again. It is years later. There are, indeed, nonexhaust problems with the pollution from automobiles, but we were denied an opportunity to open that important area.

There is another problem that we face as a small business in the procurement area. We won a contract that was a task order type of contract. As described in the RFP, the company is to gear up for a certain level of efforts, say, 10 man-years, and price that out to the agency. But only 10 percent of the requested level of effort is guaranteed. The request for proposal required that each résumé submitted by the person testifying that he was, indeed, available over the course of that year in which the contract would be performed. We won that contract, but it took 3 years before the agency awarded it. By the time we got the award, no work flowed. Indeed, we only got 1 man-year of effort.

About half way through the contract year, I went to the man in charge at the agency and asked, "Hey, what happened?" He said, "The problem was that it took us 3 years to award this. By that time we had somehow accomplished most of the work by other means." I thought I had a $1 million contract. We even celebrated when we got the award. It turned out to be what I call the "empty bag contract." We see many of them being advertised. I wonder if the 10 to 1 range in effort isn't too great to ask a small company to stand ready to perform. I think the company should be guaranteed at least 50 percent of the total effort it must stand ready to perform, rather than only 10 percent which becomes an unreasonable burden requiring the company to "stockpile" personnel.

I don't know the answers to these procurement problems, but they are major difficulties to small businesses.

Thank you, Mr. Chairman.

Mr. BROWN. There are excellent examples that need to be exposed in order that we can try to get the agencies to include in their thinking some ways to avoid these, or the problem that you first focused on, that is, of having an idea that was a little before its time. I think that is a rather common problem with the innovation of all kinds. I suspect that there are some big firms that run into the same kind of problem. It is very regrettable.

If we could spotlight a way to perceive the problems earlier and start developing solutions to them earlier, we would be much better off than we are. I don't think that there is an institutional solution. At least one doesn't come to mind very readily.

Do any of you other gentlemen have any suggestions about that?

Dr. EDWARDS. Yes.

Mr. BROWN. Go ahead.

Dr. EDWARDS. The day before yesterday that was really my point in suggesting that there be such an agency.

Mr. BROWN. Yes.

Dr. EDWARDS. Some group of people that don't necessarily have to be totally employed by the Government in the sense of making it full-

time Government people. But there must be a group of minds in this country that could perceive the problems, Mr. Chairman.

Mr. BROWN. The institutional solution that occurs to me, and has, from time to time, is precisely what you suggest. Shall we say it is a foundation type of organization similar to the National Science Foundation.

Dr. EDWARDS. Yes.

Mr. BROWN. Similar to it.

Dr. EDWARDS. Yes.

Mr. BROWN. It would be looking at the technologies of the future, just as the foundation looks at the knowledge base of the future. This is without regard as to whether there is the immediate application. It is quite proper. We find that it strengthens the United States and the U.S. economy to have a strong knowledge base. It would equally strengthen it to have efforts of the developing technology base. This is even though we are not exactly sure of what the application would be, or the market at this immediate moment.

Dr. EDWARDS. Yes, sir.

Mr. BROWN. This committee is considering at least the possibility of such legislation. At the same time, the Science Foundation, through the SBIR and our program, I think, is trying to give assistance to this sort of development.

Dr. EDWARDS. I feel sure that they are the building blocks that they are around and could be assembled.

Mr. BROWN. Let me ask this general question. The administration, in its statement on innovation and productivity last year, based upon a lengthy 2-year study by the Commerce Department, put great emphasis on this type of activity. It indicated as to the SBIR there would be substantial funds, $150 million in various departments, that would be utilized for these kinds of programs.

Now, here in NASA and DOT, we are getting a response that this is not exactly applicable to the kind of work that you do. I don't quarrel with that. What I quarrel with is the idea of perhaps holding out a program that wasn't as well developed and, then, wasn't as strongly followed through as it might have been.

Could you gentlemen from NASA and DOT indicate if there was any administrative effort to get you to think about whether or not this kind of thing would be applicable in your operations, or was this more in the nature of holding this up as a good idea? If you see the possibility of running with it, fine. If you don't, then maybe better luck next time. How much following through would there be in your departments?

Mr. EVANS. May I respond?

Mr. BROWN. Mr. Evans.

Mr. EVANS. I would like to address that.

Mr. BROWN. Yes.

Mr. EVANS. I mentioned in my statement that we had looked at the SBIR program and had, indeed, discussed it with NSF. This was in the summer of 1978. Our analysis was neither casual, nor our look brief.

Mr. BROWN. It was not based on the innovation message that came from the White House.

Mr. EVANS. No, sir. This was 1978. We looked in some depth as to what the SBIR program was doing. We concluded that we don't have the support stimulation role in that sense. What we looked to do essentially were two things. It was to take a concept of that nature and, within the scope of our mission, to apply it in an area where we could target in supporting research and technology areas that were compatible with our mission. No. 1 and, hopefully this would lead to future flight projects. We did that with the intention and expectation that we could put seed money in basic research and create the capability for a small business base on the major flight projects. This is so that we could go into R. & D. subcontracting with a full knowledge of the capability that existed. It was, in that sense, a two-tier program. This is what led us 2 years ago to the concept that we have. It was not a casual review at all.

Mr. BROWN. How about the Department of Transportation, Dr. Fairman?

Dr. FAIRMAN. Mr. Chairman, we have not done any significant work in this area.

Mr. BROWN. You have not?

Dr. FAIRMAN. No.

Mr. BROWN. I gather that you felt this was not either directly related to your mission or compatible with your needs in terms of the R. & D. program.

Dr. FAIRMAN. Yes, sir. That is probably correct. We have really no objection to that program. We would be very pleased to work with SBIR and NSF, but we have not made any effort in that area.

Mr. BROWN. To your knowledge, you don't participate in any governmentwide programs specifically focusing on the SBIR type. You are part of a general concern with small business, with minority business.

Dr. FAIRMAN. Right.

Mr. BROWN. It doesn't focus specifically on the process by which you can develop capital flows to innovative high technology small business.

Dr. FAIRMAN. That is correct.

Dr. CANTEY. We can safely say that we have a very strong initiative in the small business area with the other agencies of the Office of Federal Procurement Policy with the Small Business Administration. Our priorities have not matched in terms of the high technology areas. This is not to say that we have no interest, or that there may not be some matches that we can find in the near future.

During the break, Mr. Scoville and I talked about some areas where the Office of Federal Procurement Policy has the lead in being able to deal with the other agencies. We look forward to being able to do this. We serve on a number of committees with the Office of Federal Procurement Policy, Mr. Chairman.

Mr. BROWN. Yes.

Dr. CANTEY. That is one that we would be most happy to continue with.

Mr. BROWN. Thank you.

Dr. CANTEY Yes, sir.

Mr. BROWN. Have you any questions to ask at this time, Mr. Scoville?

Mr. SCOVILLE. No.

Mr. BROWN. Mr. Lloyd.

Mr LLOYD. Thank you, Mr. Chairman.

Mr. BROWN. Do you have questions?

Mr. LLOYD. Yes. Do you feel that we are interfacing the two agencies today, such as NASA and DOT, in such a way as to stimulate the development of this type of technology? Do you feel that you have good working relationships, one to the other, or do you even talk to each other?

Go ahead, Mr. Evans.

Mr. EVANS. I would say the answer to both is yes. I would say it this way. This is in responding to the question of Mr. Brown, also.

Going back to 1978 and 1979 when we were developing a program similar to the SBIR, we met with the Small Business Administration and with representatives of about eight departments. We explained at the time what we were doing. We had frequent conversations on our part at NASA. We are probably closer with DOD and DOE, which are agencies that are more akin to the type of thing that we are doing. But in that case, this was very frequent. We had frequent contact with them and exchanged ideas on a continual basis.

Dr. FAIRMAN. We have a number of joint R. & D. programs with NASA. Also we have them with DOE and EPA. We do work with them in a number of areas, yes.

Mr. LLOYD. Thank you.

Dr. FAIRMAN. Yes, sir.

Mr. LLOYD. One of the things that I kept hearing as a recurrent theme in hearings we held around the country was that Government was really unresponsive. Not only were you unresponsive, but sometimes it was almost as though you would get a small business ready to do something and then transfer their technology. The next thing you knew, you were almost tearing them down or duplicating their particular efforts.

Do you think, No. 1, that is a fair evaluation, or, No. 2, that you are conducive to stimulating people in the areas of technology? Anybody can answer that question at this time.

Dr. CANTEY. My own perception, if I understand you, Mr. Lloyd, is that there may be different perceptions of the question of really what is actually happening with respect to the communications between the various departments and whether or not there are benefits that are derived from some of the joint ventures and joint efforts, and do we really understand each other.

Mr. LLOYD. That's right. There are different perceptions. They say, contrary to what you state, this is not so. They don't have that feeling. Whether they are correct or not, they have this perception, and having this perception, this can be very debilitating to the whole program.

Dr. CANTEY. Yes; one of the things that I would like to say in response to that is that it is much like the activities as we described them as we began the hearings. So many of the things that we do are not front-page type activities. A number of committees on which I have served in the past in working for the Federal Railroad Administration within the Department of Transportation, and working on the committees at the Academy of Sciences and, specifically, the

Transportation and Research Board and the Transportation Research Forum, there we had pushed very diligently the state of the art. We met a number of times at Woods Hole, Mass., to discuss the past, what is going on now, and where we should go in the future.

Very often, however, driven more by current events, that is, we were driven more by this than we would like to have been driven. Because of the fact that many times we were overwhelmed by the existing overwhelming news items, then we were not given very much play in some of this. I feel that a fairly substantial contribution was made there.

Mr. LLOYD. Thank you very much.

Dr. CANTEY. Thank you, sir.

Mr. LLOYD. Mr. Evans.

Mr. EVANS. In the course of my job I travel quite a bit. This is to areas where our centers are located, specific areas of the country. I find two perceptions. There are those that don't know us as an agency that well, other than the Apollo program and the like, and those who have dealt with us. Generally speaking, in the latter case; I get a very favorable impression here. What frustrates me is the difficulty in communicating to the extent that I would like to see us do. I could cite you an example.

Just before testifying here last November, on the same subject as today, the Small Business Administration, DOD, DOE, and NASA sponsored a small business R. & D. symposium. We had clear representation there. One day was essentially devoted to NASA. Mr. Roberson spoke on technology utilization. Dr. Deutch spoke on supporting research and technology. I spoke on procurement programs. Dr. Frosch also spoke. In the course of my speech, I covered a range of things such as research and technology operating plans, a plan that we put a lot of effort into which covers essentially 700 areas of interest to NASA, as such. I spoke of the application notices that we put out in more discrete areas, and the announcement of opportunity that we put out. I described what these were and asked for a show of hands of those present as to how many were familiar with them. It was not more than 20 percent.

We went to the extent of setting up remote displays there to demonstrate the capabilities of our scientific and technical information facility in Baltimore. I, again, raised the question in the course of the speech, as to how many people were familiar with this type of information which is available, where it is, how to get it, and what this can tell you. It was 10 percent. At the end of the day, it turned out to be a winner because most of the people there went up to see it at the time.

I would have to say that communications are one of our greatest problems.

Mr. LLOYD. Thank you.

Mr. EVANS. Yes, sir.

Mr. LLOYD. Thank you, Mr. Chairman.

Mr. BROWN. Mr. Evans, I have a great admiration for NASA. Certainly, my comments are not intended to reflect otherwise, because I feel that the agency has made a tremendous contribution to the economic future of the country.

In looking at the history of NASA, I see that we have had a technology utilization program almost from the beginning, which was aimed at making available new knowledge created. It cut off that role at a certain point. It would make the knowledge available but it wasn't really responsible for what it intended to aid small business in making plans for the commercial exploitation. Am I reasonably correct in this particular perception?

Mr. EVANS. I feel somewhat to the contrary, we had focused quite a bit in that area.

Mr. BROWN. Are you suggesting commercial utilization of the knowledge?

Mr. EVANS. Indeed. That could be addressed in more depth by Mr. Roberson, Mr. Chairman.

Mr. BROWN. I need to refine my thinking about just how far you carry this. I am reasonably sure that you don't carry it to the extent that NSF carries their SBIR program, which leads up to a plan for the involvement of venture capital and that sort of activity leading to some form of market penetration.

Mr. EVANS. No, Mr. Chairman, we do not go to that extent. We feel that the question of capitalization or venture capital is something that is outside our realm.

Mr. BROWN. Then another example comes to my mind of NASA's role. It went far beyond NASA, of course. This is in setting up Comsat. That is a spinoff from the space program. It is to exploit communications satellites. Comsat was created by an act of Congress. It was given a scheme of capitalization in the form of a certain pattern of stock issuance, and so forth. The result has been an unqualified success, I guess you would say. Again, it went beyond NASA's role. I guess the NASA input at the time probably was of a nature that we think that this technology is ready for commercial exploitation. It needs institutional framework that you perhaps suggested, or you have tried to make suggestions as to the kinds of institutional framework.

I am suggesting that we have a large number of such opportunities. I rather suspect that NASA is involved right now in the Earth resource sensing field. It involves private enterprise in providing a range of services that could spin off from the Earth resources sensing technology that NASA has developed. Am I correct in that?

Mr. EVANS. Yes, sir, you are. That is particularly in the utilization of satellite data or the marketing of the satellite data.

Mr. BROWN. Thank you.

Mr. EVANS. Yes.

Mr. BROWN. This reminds me of one of Dr. Levin's points on the ideas developed that were premature before the sensing. I think it was environmental monitoring. There are firms that have arisen. Comsat has acquired as a wholly owned subsidiary one environmental sensing firm, if I recall correctly, and is providing an influx of capital into that firm in order to try to develop more markets, more commercial markets, within the sphere of the Comsat operations. I think that this was sound business. But the question comes to my mind which is, Mr. Evans, is this an inappropriate role in identifying small firms that could be assisted in developing a market position in an area like environmental monitoring or the Earth resources sensing or providing

an information service based on the kind of instant data that is now available from satellites? I saw some demonstrations of this a few days ago at Goddard. It is quite economical now to read out a fast range of data, presumably some with commercial applications. There should be more firms entering into the exploration of commercializing this. But NASA does not see itself as having the role of assisting a firm to go through the development process in order to do this.

Mr. EVANS. In the area of utilization of the Earth sensing data, the satellite data that we get, I think particularly in technology transfer, that we see a role of acquainting and educating, if you will, small business in an area where we see a growing market for the marketing of this data, such as State and local county areas of significance. Dr. Levin made his comments before and it was unclear to me whether he was talking about a proposal for environmental satellites, which may be a new start of $200 million or $300 million, or whether he was suggesting that this might be an appropriate new start for NASA. I would guess that the period on a new start of that nature is very significant.

If, on the other side of the coin, from the standpoint of sensing instruments, wherever we do that, the primary purposes of these notices is to advise people like Dr. Levin that we are seeking ideas now in a program that we have for sensing the type of data that he is talking about. So, it is unclear to me what he was saying.

Mr. BROWN. Do you want to comment?

Dr. LEVIN. This was back in 1968 before this program you are speaking of was initiated. There was an attempt to develop satellite technology for the Federal agencies. What NASA did was take me around to see some of the other agencies. I tried to persuade them. Shortly thereafter, the program was funded to a very large company.

Mr. BROWN. Thank you.

Dr. LEVIN. Yes.

Mr. EVANS. Yes, sir.

Mr. BROWN. Are there any questions, Dr. Kramer?

Dr. KRAMER. No.

Mr. BROWN. All right.

Mr. SCOVILLE. I have one brief question for Mr. Evans at this time.

Mr. EVANS. Yes.

Mr. SCOVILLE. I guess that I would also like to ask this of Dr. Levin.

Mr. LLOYD. Go ahead.

Mr. SCOVILLE. I might ask this of Dr. Edwards as well.

On page 4 of your testimony, you say:

> Similary, if we were to remove the FY 1979 funding on all multiyear R. & D. contracts, each valued in excess of $10 million, the small business R. & D. share increases to about 30 percent.

It seems to me that statistics itself illustrates the problem small business perhaps may have in dealing with a large agency such as NASA, which is, namely, that they tend to get the short-term contracts. They don't get the ones that have a long-term stable base that they can build up the expertise in a given area.

The other thing is that, also, $10 million, while it looks like a large sum, if it is divided into 3 or 4 years, is only, in fact, a couple of million dollars a year. It seems that a fair number of small businesses

could begin to handle contracts of that size. So, I guess that I would like to have your comments as to whether you think that fact is a problem. That is, it is hard for small businesses to take part in the longer term contracts to provide stable funding for developing a new technology.

As I said, I guess that I would like to have the comments of the small business representatives here as well on that.

Mr. EVANS. I will comment on that initially, if I may. The figures cited in there would be by way of illustration of the size of the contract. Predominantly, those are hardware contracts. Most of those are major programs where we cite $10 million in terms of a rule of thumb with respect to size. We probably have in mind $50 million to $200 million. In most of these, we are talking about the new sciences programs with respect to continuing research, and particularly, in research and technology objectives. Many of those in R. & D. are continuing, both large and small business. Many of them are not. Where they don't turn out to be fruitful, they are not. Those are continuing efforts.

Mr. SCOVILLE. The reason that I raised this is that there is the continued preparation of a proposal. It is a fairly substantial burden of manpower and ideas. This is why it would seem important even though they may get the funding year after year. But every year you have to come back to remake the proposal. That is a lot of work for the small firms to have to do. This is why I was raising the question.

Mr. EVANS. This is one of the reasons that we use something other than formal solicitations, because an unsolicited proposal doesn't have to be all that extensive in its preparation or nature. We are seeking the concept. As to the continuation of efforts, we are not seeking proposals in the depth that we would in a normal competitive situation where you go through an entire evaluation process.

Mr. BROWN. Dr. Levin.

Dr. LEVIN. I would like to reply positively. It is possible for a small business to stay in the running for a period of time, but the consequences are pretty difficult. I have just concluded a contract with NASA, a series of contracts with NASA, which ran 18 years. We originally came to NASA with an unsolicited proposal to develop a technique to look for life on Mars. This was before there was a planetary program. NASA said that sounds like an interesting idea. "Give us a proposal." We did. We got funded. Each year we had to compete again for funds. We were successful. Then the Voyager program was formed and there was a national competition for the experiments to go to Mars. The primary mission at the time was to look for life. We were selected along with three other experiments in a national competition. The Voyager program was then scrubbed because of spending problems. NASA continued to evaluate our proposals and to continue them annually. Then the Viking mission was formed. For the first time, it looked as though we could have some continuity.

I guess 1969 saw the formation of the Viking mission, which was launched in 1975. After passing two more national screening contests, the funding of our experiment continued. We landed on Mars in two separate places. We happen to have the "notoriety" of having obtained a positive signal indicating life on Mars. We are still attempting to see whether this might be due to chemical means that we don't en-

counter on Earth. At any rate, if I were not here now, I would be finishing the final report to NASA, including the interpretation of those data we got from Mars. It was extraordinarily difficult as a small company to maintain our funding and position in competing primarily with academic organizations and large companies. But we were able to do that. It was tough, but, in my view, the rewards were certainly worth it. It is the most exciting thing I have ever done.

Mr. BROWN. That sounds like a testimonial for NASA.

Dr. LEVIN. I think it ought to be. That doesn't mean there are no problems. There have been, even in that area. But, certainly, there was a route whereby a small company could do this, Mr. Chairman.

Dr. EDWARDS. I would like to echo that, if I may.

Mr. BROWN. Yes.

Dr. EDWARDS. I appreciate the question. Certainly, stability in funding and predictability in funding is extremely important for a small business. In many cases, new technology is funded only by the Government. The inefficiencies involved in recompeting should be considered. It may well be that is the best way to do it. I don't know. But I know that in our own case, while we have been able to maintain with the Department of Defense a program that has continued since 1970, but it ain't easy, as Dr. Levin indicated.

I do think that if there is any message that I could leave with this committee and with the panel it is that not only should the funding for the program be predictable and stable, but if it is not going to be, then I think that the company should be notified. This is because one continues to have to pray for the contract to come through. Finally it does. Then, not only is this an empty bag contract, but maybe the bag already has a hole in it by the time you get it. That is really an important message. I would certainly hope that you recognize that, Mr. Chairman.

Mr. BROWN. Gentlemen, there may be some additional questions that we would like to ask you. If so, I would like to be able to submit them in writing.

I want to express my thanks to you for helping the committee to understand some of the many aspects of this problem. I assure you this has been most helpful to us. I thank you again for your participation.

Dr. LEVIN. Thank you.

Mr. EVANS. Thank you, Mr. Chairman.

Mr. BROWN. The subcommittee will stand adjourned at this time.

[Whereupon, at 12:45 p.m., the subcommittee adjourned, to reconvene at the call of the Chair.]

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APPENDIX

STATEMENT March 14, 1980

of

MR. BELTON JONES, JR.
DIRECTOR, PROCUREMENT OFFICE

ADMINISTRATION AND PROGRAM SUPPORT DIRECTORATE
MARSHALL SPACE FLIGHT CENTER
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

for the

Subcommittee on Investigations and Oversight
Committee on Science and Technology
House of Representatives

Mr. Chairman and Members of the Subcommittee:

I wish to express my appreciation for the opportunity to provide the Subcommittee information on the Marshall Space Flight Center's policies, actions and views on opportunities for small high technology firms to participate in the Center's programs. Also, to be discussed, will be the initiatives taken at the Marshall Center to promote increased involvement of the small business community.

The Marshall Space Flight Center (MSFC) is a research and development (R&D) center engaged in high technology development. Principal roles of this Center are management and development of space transportation systems; management, development and integration of payloads and experiments for assigned space flight activities; and application of space technology and supporting scientific and engineering research. Since the formation of MSFC 19 years ago, our extremely successful programs have required the application of new technology and have encouraged innovation.

From the very outset, MSFC programs have been a national partnership of scientific, technical, university and managerial participation wherein private industry has contributed significant ideas and creativity. Here the contributions of small business have been conspicuous and are reflected in a steady growth in small business procurement. Today, approximately 78 cents of every dollar in the MSFC budget is put to work in some form with the educational, scientific and business communities through the procurement process.

This extensive reliance on the private sector for innovation, technology growth and operational support will continue - and concurrently small business participation is expected to grow.

The MSFC relationship with the small business community is a prime example of growth, learning and innovation. From the start the Center has capitalized upon the initiative, imagination and productivity of small business in both space and aeronautical programs. The results have been gratifying, and MSFC can look back with pride on the involvement of thousands of small businesses in the Saturn, Apollo, Skylab and other manned space programs of the 1960's and 1970's.

Today there are many small businesses working on the Space Shuttle, Spacelab, Space Telescope, Materials Processing In Space and Spacelab Payloads projects. During the past year small business concerns received approximately $35,000,000 in prime contract awards at MSFC. In addition, MSFC prime contractors awarded $49,000,000 in subcontracts to small business concerns which have greatly contributed to the rapid increase in new technology developed.

The Materials Processing in Space (MPS) project is a prime example of utilization of small high technology firms to successfully accomplish its mission. In fiscal year (FY) 1980, small high technology firms will be awarded $1,005,000 or 11 percent of the total contracts awarded for MPS. These awards have doubled those made in FY79 with more increases expected.

Within the last decade MSFC has focused considerable energy and imagination in the development of minority business opportunities. Minority firms received $12,623,000 in MSFC prime contract awards in addition to the millions of dollars awarded as subcontracts to the MSFC prime contractors. The MSFC record has been excellent with minority prime and subcontract participation increasing steadily. Here again, MSFC is constantly seeking, and finding, new reservoirs of minority capability to tap within the existing programs. Growth in the minority source base is expected to continue along with the resulting procurements.

All procurements, whether by formal advertising or by negotiation, are made on a competitive basis to the maximum practical extent. Competitive proposals are solicited from all qualified sources of supplies or services as are deemed necessary by MSFC to assure full and free competition. This same policy applies to the procurement of all types of supplies and services necessary to meet MSFC's requirements and thereby to

obtain for the Government the most advantageous contract - price, quality, and other factors considered. In the area of R&D, contracts will be awarded to those firms determined by responsible personnel to have a high degree of competence in the specific branch of science or technology required for the successful conduct of the work.

It has been MSFC policy to place a fair proportion of its total purchases and contracts for supplies, R&D and services with small business concerns. Every effort is made to encourage participation by small businesses in the acquisition of supplies and services that are within their capabilities. Small Business and Small Disadvantaged Business Utilization Programs are being implemented for the accomplishment of established program goals. This policy is to assure that procurement and technical personnel are informed of the benefits that accrue to the Nation and to NASA through the proper use of the capabilities of small business concerns in the procurement of MSFC requirements, and that all reasonable action is taken to increase the level of participation by small business firms in the awards for the Center's products and services.

This approach includes the setting of Center-wide small business goals, implementation of our small business set-aside program and unsolicited proposal methods to increase small high technology business participation. More than 300 procurements totaling $7,351,000 were set aside exclusively for small business competition in FY79. For example, a contract for flight horizon sensors in connection with the Spacelab Payload project was awarded under the set-aside program to Ithaco, Inc., a small high technology firm. Also in FY79, 15 percent of the unsolicited proposals received at MSFC were awarded to small high technology firms. As a result of an unsolicited proposal from a small high technology firm, the Banton Corporation of Manor, Pennsylvania, was awarded a subsequent contract for design and fabrication of two complete Coal Face Measuring Systems for underground use.

To broaden the industrial base, our policies include: Locating additional qualified small business suppliers by all appropriate methods; giving wide publicity to MSFC contracting methods and practices; publicizing proposed procurements by use of advance notices or other appropriate methods; including all established and qualified potential small business suppliers on bidders mailing lists; dividing proposed acquisition of supplies and services, except construction, into quantities not less than economic production runs so as to permit bidding on quantities less than the

total requirements; examining each major procurement to determine the extent to which small business subcontracting should be encouraged or required; allowing the maximum amount of time practical for preparation and submission of bids and proposals; and maintaining liaison with Federal, State, and local agencies for the purpose of providing information and assistance to small business concerns.

The MSFC Small Business - Industry Assistance Officer acts as liaison between the Procurement Office and small business concerns. He serves as a central point of contact to which small business concerns may direct inquiries concerning participation in the MSFC procurement program and small business matters. He also acts as liaison between MSFC and the Small Business Administration field offices and representatives to assure administration of the small business program designed to locate capable small business sources for current and future MSFC procurements.

Small business concerns are selected for contract awards whenever possible, and in some instances are selected over large business. This not only stimulates the small business community but increases competition. For example, in 1979 Foster-Miller Corporation, a small business, was selected over Bendix Corporation for contract award on the Longwall Coal Guidance System. This was a $1,000,000 procurement. Likewise, the DCA Reliability Laboratory, a small business, was selected over McDonnell Douglas Corporation for contract award for parts testing. Here the award was $350,000 with a potential for additions. Those small businesses had superior technical proposals as well as lower cost proposals. This further illustrates the success at MSFC regarding the progress made in increasing small business participation.

The past efforts in this area have been very gratifying; however, this experience serves as encouragement to move ahead with increased participation by the small business community. For example, over the next three years several hundred pieces of hardware in support of Shuttle launch operations at Vandenberg Air Force Base will be procured from small business concerns. Plans are now being made to determine which procurements will be small business set-asides as well as assuring that small business concerns will have an equitable opportunity to compete for contracts particularly by arranging solicitations, time for preparation of bids, quantities, specifications, and delivery schedules so as to facilitate the participation of small business concerns.

Another method employed at MSFC is to foster small business participation in all major programs. This is achieved by extending the use of small business subcontracting requirements into the major systems acquisitions wherever it can be identified that specific components or portions of these systems can be broken out for small business. This will be particularly applicable where small business firms have participated in the early supporting research and technology efforts. Through these efforts, MSFC expects to realize the benefits of an agressive and growing small business contribution to the major programs.

The Performance Evaluation Boards (PEB) which evaluate contractors' performance for establishing award fee payments at MSFC, have contributed to increasing small business participation by implementing changes which motivate prime contractors to subcontract with small business firms. In contractual arrangements that are cost-plus-award-fee, the evaluation criteria for award fee includes consideration to the contractor for subcontracting to small and minority businesses. As a member of the PEB, constant attention is being given to this criteria by the Procurement Office. Here the prime contractor, as well as MSFC, can reap the benefits from the scientific, technical and managerial skills displayed by small business. This, in addition to motivating the prime contractors, causes large businesses to develop a data bank of information on the technical competence of such concerns as well as continually searching for competent small business concerns.

MSFC, as well, is searching continually for and developing information on small business concerns competent to perform high technology work as well as other work required to meet the needs of the Center. Advanced publicity which includes the use of the Commerce Business Daily is utilized to the fullest extent. A bidder's mailing list is maintained on a current basis to ensure that all small business firms which have made acceptable application to NASA or which appear from other information to be qualified are included.

As Procurement Officer at MSFC, one major responsibility is to establish procurement procedures which implement Small Business Set-Asides and Utilization of Vendor Source Systems.

The MSFC Small Business - Industry Assistance Officer is utilized for assistance in determining applicable procurements for set-asides to small businesses.

All new procurements are reviewed to assure that a fair share of the procurements are awarded to small business concerns and due consideration is given to minority business enterprises.

The procedures developed to utilize the Vendor Source System have greatly increased small business awards especially in providing R&D hardware and equipment in support of MSFC programs. The data, which is computerized, is furnished in the form of commodity and services, research and development listings and catalogs which are primarily used by negotiators and buyers in determining vendors for contracts and other types of procurement actions. It is a policy at MSFC to utilize the information provided by the computerized system for the equitable selection and rotation of vendors, with special emphasis on small business concerns.

In conclusion, although we at MSFC believe that significant progress has been made in enhancing the benefits to NASA of potential small business contributions, we are continuing in our efforts to increase and broaden the small business participation in the procurement process.

March 14, 1980

STATEMENT

of

MR. AUBREY D. SMITH
DIRECTOR, TECHNOLOGY UTILIZATION OFFICE

ADMINISTRATION AND PROGRAM SUPPORT
MARSHALL SPACE FLIGHT CENTER
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

for the

Subcommittee on Investigations and Oversight
Committee on Science and Technology
House of Representatives

Mr. Chairman and Members of the Subcommittee:

The Marshall Space Flight Center (MSFC) has had a Technology Transfer Program since 1963. The objectives of the program are to identify new technology developed by MSFC employees and contractors and to transfer this technology to the public to increase the benefits from the nation's aerospace investment. Presently the MSFC has a small office with 10 man-years of effort dedicated to fostering the flow of technology on a formal basis to users through mechanisms intended to foster maximum transfer. Users may be individuals, small and large businesses, city and state governments, and other federal agencies.

This effort at the Marshall Space Flight Center is part of a NASA network supported by similar activities of other NASA Centers, seven Industrial Applications Centers, and two state application centers to make direct calls on industry, one center at Athens, Georgia, for computer programs, and six Applications Teams to identify general public needs and help identify demonstration projects.

Two primary mechanisms are used to transfer technology. One is a mail order system described later, and the other is applications projects that are are accomplished jointly with outside agencies and industry. First, I will discuss some of our applications projects:

PROJECT FIRES (FIREFIGHTER'S INTEGRATED RESPONSE EQUIPMENT SYSTEM) - Project FIRES is jointly sponsored and funded by NASA and the U. S. Fire Administration with the objective of developing better protective clothing and equipment for the nation's firefighters. According to the Department of Labor, firefighting is the nation's most hazardous occupation with a 50 percent chance of injury for each firefighter each year. Innovations in firefighter protective clothing have been infrequent for many years.

The firefighter community was brought in to identify the protection requirements. A User Requirements Committee made up of fire chiefs, union representatives, and other municipal officials from various cities across the United States was formed. In addition, seven consultants were engaged to assist the committee and the design team. The full committee is identified on Figure 1. The committee, the advisors, and the development team met as necessary to review and provide direction to the work. A complete set of requirements for firefighter protective clothing is now documented for use by public safety officials and fire departments.

Project FIRES is nearing completion. The protective ensemble completed tests in late January at Stanford Research Institute, Menlo Park, California. A photograph of the ensemble is shown in Figure 2. The ensemble has a choice of long or short coat and bib pants made of lined polybenzimidazole (PBI) or 50/50 Kevlar/Nomex. The jacket has a detachable hood for neck protection that can be worn beneath the helmet. The helmet is 1/8 inch thick reinforced with layers of glass and Kevlar. The face shield of chemtempered glass backed with polyester sulfone is retractable into the helmet when not in use. The sleeves contain wristlets to hold the sleeves down and protect the wrists. A choice of latex dipped cotton jersey or knit Kevlar gloves with leather palms will be available. The boots are of polyurethane sprayed Nomex over polyurethane foam insulation and are lined with nylon jersey fabric.

The prototype ensemble provides a significant improvement in firefighter protection. In addition to being safer, it weighs about half as much as currently-available suits, increases mobility, and should be available at prices only slightly higher than currently available garments. To expedite the technology transfer, plans are being explored with the U. S. Fire Administration for up to ten cities to be selected for in-service field demonstrations under cost-sharing arrangements, with each selected city performing its own procurement to an agreed-to specification.

Prospective industry suppliers have been invited to three briefings currently underway where the ensemble is being displayed. West Coast fire department suppliers attended a briefing in Los Angeles on February 28. Southern suppliers are invited to a New Orleans briefing on March 13, and Northeastern suppliers may attend the March 27 briefing scheduled at the Fire Department of New York Training Center at Randalls Island, New York. This demonstration will provide small businesses with an excellent opportunity to produce proven helmets, boots, gloves, and clothing that have been designed to include space-age materials.

POWER FACTOR CONTROLLER (PFC) - The power factor controller is a device invented by an MSFC employee, Frank Nola, and is a classic example of how small business can utilize NASA technology. The PFC is a small electronic device that monitors the phase angle between voltage and current and corrects out-of-phase conditions that cause inefficiencies in electric motors. Savings of up to 50% in electric power consumption have been demonstrated. To provide confidence in the concept, an independent evaluation was obtained from the Engineering Department of Auburn University, and the Marshall Space Flight Center built and tested 12 units. The test data and designs were made available to industry. These

precautions were necessary to reduce the risk to industry especially to small businesses interested in manufacturing and marketing the controller. To further reduce the risk, a market study was conducted to determine the probable market. Based on the results of that study, which projected a potential energy savings considered the equivalent of 50,000 barrels of oil per day, a joint Department of Energy (DOE)/NASA/industry project was established to expedite this important transfer. The industry participants were selected through a competitive procurement process. Two small businesses were selected to provide a production type design of the PFC, provide test units, reduce production cost, and to develop a three-phase unit. Each contractor is to test his controller with a potential user to provide field experience and determine savings. The three-phase unit also holds a great promise for energy savings since most large electric motors are three-phase. About two-thirds of all electricity is used to drive motors, and 80% of this is used by large three-phase motors. The MSFC is presently surveying, with the help of a small business architect engineering firm, electric motors at the MSFC to determine the number and sizes of motors that could be operated more economically with a PFC. The general public interest in the PFC has been significant.

Last year the MSFC Technology Utilization Office responded to 15,000 public and industry requests for assistance and information on the power factor controller, and there are 102 licensees of the NASA patent.

BIOMEDICAL PROJECTS - Several projects are also underway in the biomedical area. One of the more promising is a device to permit bladder control for paralytics or incontinent patients. Control is obtained by use of a prosthetic urinary sphincter which is an implant device with an inflatable collar on the urethra and a control valve and bulb in the scrotum, or labium. An artist's concept of the sphincter is shown in Figure 3. The first application of the device will be made in March 1980 when animal implant tests will be initiated. The project is managed by the Marshall Space Flight Center and involves Rochester General Hospital in New York and the Parker-Hannifin Company, as well as a prosthetic manufacturer yet to be selected. This project makes use of highly reliable miniature valve technology developed for the space program and provides an excellent opportunity for a high technology, small business firm.

Another project in the early stages is an Implantable Programmable Drug Infusion Pump (IPIP) which is also an implant device intended as a safe and reliable means for infusing a variety of drugs into the body at accurate dosage rates. A line illustration is shown in Figure 4. The IPIP will make use of technology already accomplished on the sphincter valving system and, from an earlier transfer, the heart pacemaker. One important disease for which it would be immediately applicable is diabetes. There are approximately one million Americans who require one or more daily injections of insulin. The IPIP would make it possible to provide more precise metering of insulin into the patient's body from an internal reservoir. Examples of other patients that could possibly benefit from the use of IPIP as identified by the Biomedical Teams would be those that have inoperable malignant tumors, which could be treated locally, and coronary or cerebral occlusion patients. This project involves Marshall Space Flight Center valve technology and electronic technology developed at Goddard Space Flight Center. Both Centers are participating with the Johns Hopkins Applied Physics Laboratory. The development and production of this device also could provide an opportunity for a high technology, small business firm.

Another biomedical project underway is ophthalmologic screening, which is a photometric analysis of retinal reflexes. When developed, it will be a safe and inexpensive screening for amblyopia (dimness of sight) especially for children too young to communicate. Preschool children could be screened for conditions which might produce amblyopia. If discovered at an early age, the cure for amblyopia is reported to be inexpensive and relatively simple. A joint effort is presently being negotiated with a small business, Electro Optics of Huntsville, Alabama, to help develop this system and make it available. Dr. Hudson Hay, a practicing ophthalmologist in Huntsville, will help with the medical requirements.

LIGHTWEIGHT FIREFIGHTING MODULE - The NASA, the U. S. Coast Guard, the Maritime Administration, the City of Miami, Florida, the City of St. Louis, Missouri, and two small companies have developed a lightweight firefighting module for quick response to harbor and offshore fires. Six small businesses are participating as subcontractors. Using Saturn rocket engine pumping technology, a lightweight, highly mobile, self-contained unit has been developed. Figure 5 depicts the unit in operation and the unit also being transported by helicopter. The helicopter-transportable unit weighs about 2700 pounds, pumps about 2500 gallons per minute, and reaches 250 feet with two water cannons for a period of 3 hours before refueling.

The U. S. Coast Guard has tested one unit with great success in the Gulf of Mexico near Mobile, Alabama. The City of Miami, Florida, has tested the module mounted on surplus Army amphibious craft. Miami was in great need of a firefighting unit to traverse to offshore islands and on flooded streets. Also, Miami has many miles of shore line with numerous boats. A unit will be delivered to the City of St. Louis, Missouri, next month for inland port demonstrations over the next few months under the auspices of the St. Louis Port Authority. Orders for the unit have been placed by the Dow Chemical Company following an emergency use of the module near Dallas, Texas.

TRACK/TRAIN DYNAMICS PROJECT - NASA and the Federal Railroad Administration (FRA) is conducting a joint project with the objective of reducing train derailments. Dynamic tests on several three-axle and two-axle locomotive trucks have been performed by the MSFC over the past few years based upon computerized dynamic testing experience with the large Saturn rockets. Figure 6 is a photograph of the locomotive truck test setup at the Martin Company, Denver, Colorado. A small business subcontractor to the Martin Company is to take the test information on the truck, track characteristics information from the FRA, and track curving data to provide a computer-aided, TV displayed, mathematical model of a locomotive that can predetermine locomotive behavior for a given set of track conditions. This capability should begin to shed some light on requirements for roadbed, rolling stock, and operations. The need is great as derailments are very costly and hazardous, and it is gratifying to be able to offer help from the technology base of the space program. It is also gratifying to be able to involve a small business in this important work.

DYNAMIC ANALYSIS OF CIVIL STRUCTURES - A project is being initiated this year to apply a dynamic analysis technique developed for Skylab to the dynamic analysis of civil structures such as buildings and bridges for disaster type loading

from tornadoes and earthquakes. The computer analysis technique called COBAMA for coupled base motion analysis was developed to analyze the oscillations of Skylab caused by docking operations. A joint effort with the National Society of Civil Engineers, a university, and industry is planned to accomplish this project.

TRANSFER METHODS

I would now like to discuss in greater detail the methods used at MSFC for identifying and publicizing new technology. Technology transfer left to happen by chance is a very slow and uncertain process. At Marshall we have established a formal system. MSFC currently manages about 500 research and development contracts. Each of these contracts contains a requirement for contractors to report any innovation that is new or novel and could have commercial potential or public benefit. MSFC civil service personnel similarly submit new technology reports as they conduct R&D. In FY 1979, 205 items of new technology were identified for publication by MSFC employees and contractors. About 2,200 new technology items have been so reported at MSFC since the beginning of the program.

When new technology items are made known, either by the inhouse technical staff or by aerospace industries, they are screened by various professional personnel representing many disciplines. If the proposed innovation appears to be of general interest--and many are--an advertising flyer, called a Tech Brief, is prepared on each item. (Figure 7 is an example of a Tech Brief.) Four times each year catalogs that contain Tech Briefs of such new technology reports from throughout NASA are sent to about 66,000 subscribers, including libraries, technical publishers, and industry. About 60% of the subscribers to this catalog, called the NASA Tech Brief Journal, are small businesses. Customers review the catalog, see an item they need, and send in an order for the formal technical support package that is on the shelf at the NASA center where the item was originally reported. Last year over 112,000 clients requested and received assistance from MSFC alone. This is up from about 32,000 the previous year; an annual trend curve is shown on Figure 8. This increase reflected a great interest by small business in energy-related innovations. A special mailing on solar energy by the Small Business Administration prompted 17,000 requests for assistance.

This is only a small part of the operation. Several programs are aimed at not only placing technology in the hands of users, but also assisting them in its application. One example is the center for dissemination of computer programs at the University of Georgia. At this time, 3,969 computer programs from all NASA Centers are in the inventory. Incidentally, 1300--or 33 percent--came from the Marshall Space Flight Center.

Biomedical and technical applications teams work in several ways to help identify projects of national importance, including direct contact with industry and the submission of problem statements to the NASA Technology Utilization Officers. These problems are distributed to various laboratories, and attempts are made to provide technology in solving the problem. These applications teams also participate in marketing surveys involving new technology.

One very important principal resource is a vast storehouse of accumulated technical knowledge, computerized for ready retrieval. Through the Industrial Applications Centers (IAC's) industry has access to a very large repository of technical data. More than 1.5 million of these documents are NASA technical reports.

By taking advantage of Industrial Applications Centers and Application Team services, small businesses can save time and resources by utilizing the findings of research already accomplished. The Teams and IAC's are identified in Figure 9. Several examples of such research are:

EARTH RESOURCES IMAGERY - Earth resources information from earth observation satellites can be made available through the MSFC liaison and dissemination functions with the Regional Application Center at Slidell, Louisiana. Also, through a grant with a minority institution, Alabama A&M University, a capability for full interpretation of imagery from the earth orbiting satellite, Landsat, is being established within this region. The facilities are in place, the specialists are onboard, and some joint activities with industry and other agencies are planned as resources permit.

SOLAR HEATING AND COOLING - Large technology transfer projects like the solar heating and demonstration program that the MSFC is managing for the Department of Energy are set up as separate program offices and are not covered in detail within this testimony except to point out that 35 of the 41 demonstration projects are with small businesses.

Presently the Technology Utilization Office is exploring the possibility of applying a special technology transfer effort to one of the NASA/DOE demonstration projects, a mobile solar heating and hot water system. A preliminary market study indicated a possible market penetration of 350 to 1550 units per year. This could provide a mobile unit that could be purchased jointly by several users for hot water for food processing, crop drying in the summer and fall, followed by residential heating in the winter.

In addition, the National Weather Service in Huntsville has been provided with a telephone-operated solar reporter. By dialing 772-9063 the general public can obtain the solar energy for the previous day, today's accumulation to time of the call, and the incident radiation at the moment. This was done to encourage the use of solar energy, and the reporter was manufactured and is being marketed by a small business.

Presently strategies are being developed for transfer of several items of technology. Many of these are particularly applicable to small business. Some examples are:

WIND-WHEEL TURBINE GENERATORS - This concept for driving an electric-power generator by a wind-wheel mounted with a special housing is described in Tech Brief B78-10268 and was invented by an MSFC employee, John W. Kaufman. Independent evaluations are being obtained prior to performing a market study and model testing.

IMAGE INTENSIFICATION OF DEVELOPED PHOTOGRAPHS - A post-processing method for images on photographic film and plates can be used to enhance underexposed or faded film to retrieve additional information from less dense portions of a developed photograph is described in Tech Brief MFS-23461 and was invented by an MSFC employee, Barbara S. Askins. Detailed information can be provided upon request.

ELECTRICAL INDICATIONS OF AIRFLOW RATES - This is an instrument developed for evaluation of hot-air collectors flow rate by the use of special temperature sensors. A mini-computer calculates the flow. Tech Brief B79-10090 describes this concept of work done by Charles Murrish of the MSFC.

SOLAR HOT-WATER SYSTEM - A solar water heater that meets the needs of a family of four is described in a brochure that can be obtained upon request. This direct feed system is designed to produce 80 gallons of 140°F hot water per day. Tech Brief B78-10495 and the technical support package provides additional details.

The MSFC has a very active program to transfer technology and complies with the Congressional mandate to provide the widest practicable and appropriate dissemination of the results of aerospace research and development. A continuous effort is being made to retrieve the items of new technology from the MSFC laboratories and contractors, and the public is notified of the new technology by timely publication of catalogs.

There is a continuous search for applications projects that satisfy a national need in both the biomedical and technical areas. Active projects normally total between 8 and 14 carefully selected projects. Market studies and tests are performed to reduce the risk to industry.

To further enhance the transfer process, three technology transfer displays are in use continuously for industry convention and public meetings. There is a large display of technology transfer examples at the Alabama Space and Rocket Center in Huntsville, and a Landsat imagery display is being prepared. This is augmented by public presentations and symposia.

In closing I would like to say that I believe the NASA and MSFC Technology Utilization Programs present one of the most valuable resources available to small business. We intend to continue to exert every effort to increase small business' awareness and utilization of that resource.

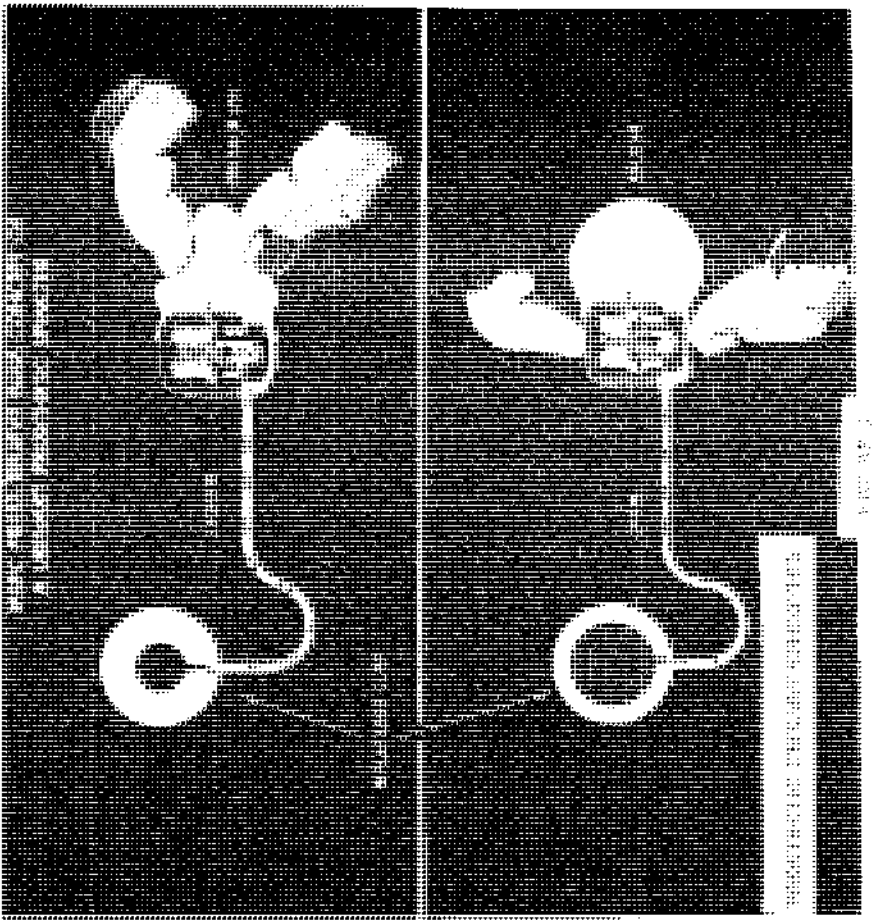
USER REQUIREMENTS COMMITTEE MEMBERS

John McLaughlin, Chief	New York, NY
Louis DeChime, Safety Director	Miami, FL
William Foley, Chief Fire Marshal	Chicago, IL
L. Robert Himes, Chief	Fort Worth, TX
Tracy Howard, Supervisor, Budget and Management Office	Denver, CO
Warren Isman, Director, Fire and Rescue Services	Rockville, MD
Jim Minx, President, IAFF	Oklahoma City, OK
William Patterson, Chief	Santa Barbara, CA
John Petersen, Volunteer Fire Council	Aurora, IL
Frank Smiley, City Manager	Newport News, VA
Leo Stapleton, Deputy Chief	Boston, MA
John Swindle, Chief	Birmingham, AL
Ralph Travis, Secretary, IAFF	Los Angeles, CA
Jack Gannon, International Vice President	Cleveland, OH
William L. Moore, Chief	Oakland, CA

FIGURE 1



66-219\0 - 81 - 49



IMPLANTABLE PROGRAMMABLE INFUSION PUMP (IPIP) SYSTEM BLOCK DIAGRAM

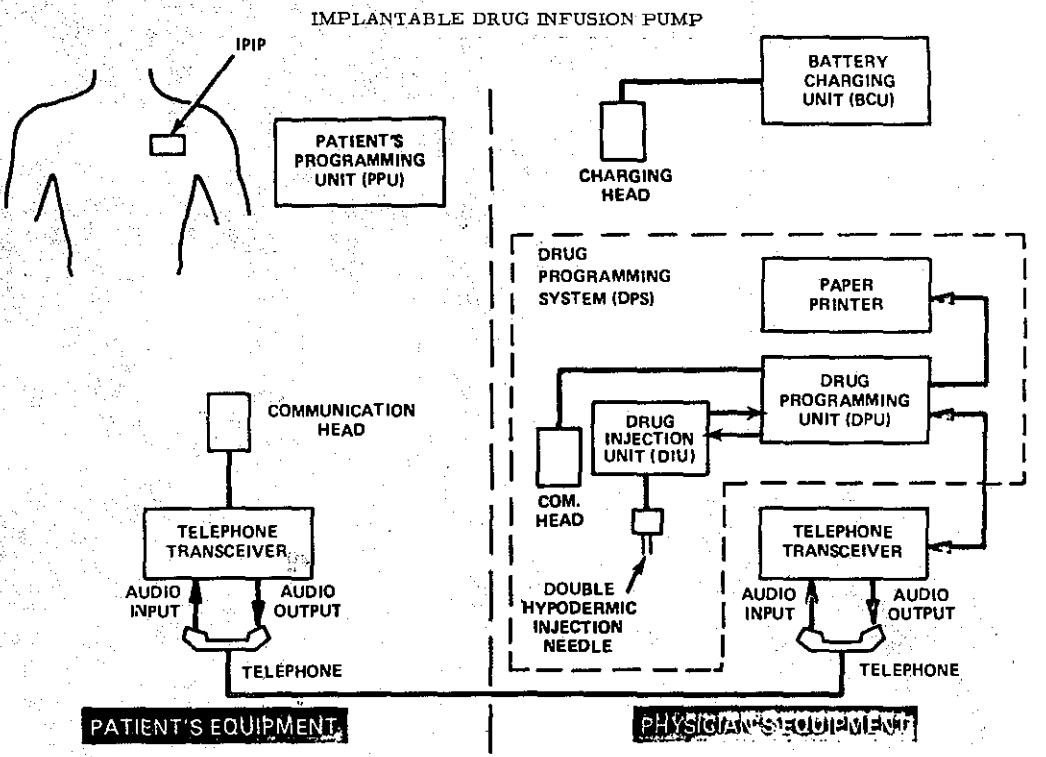


FIGURE 4

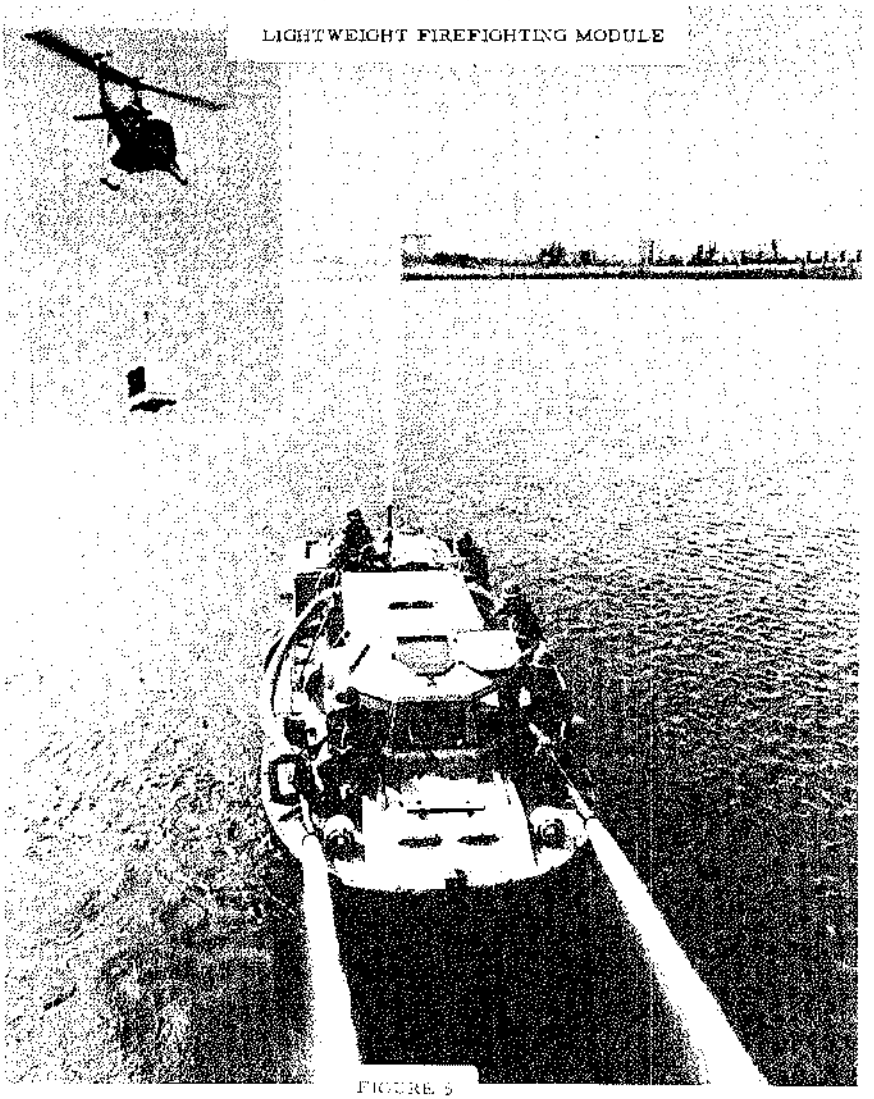


FIGURE 5

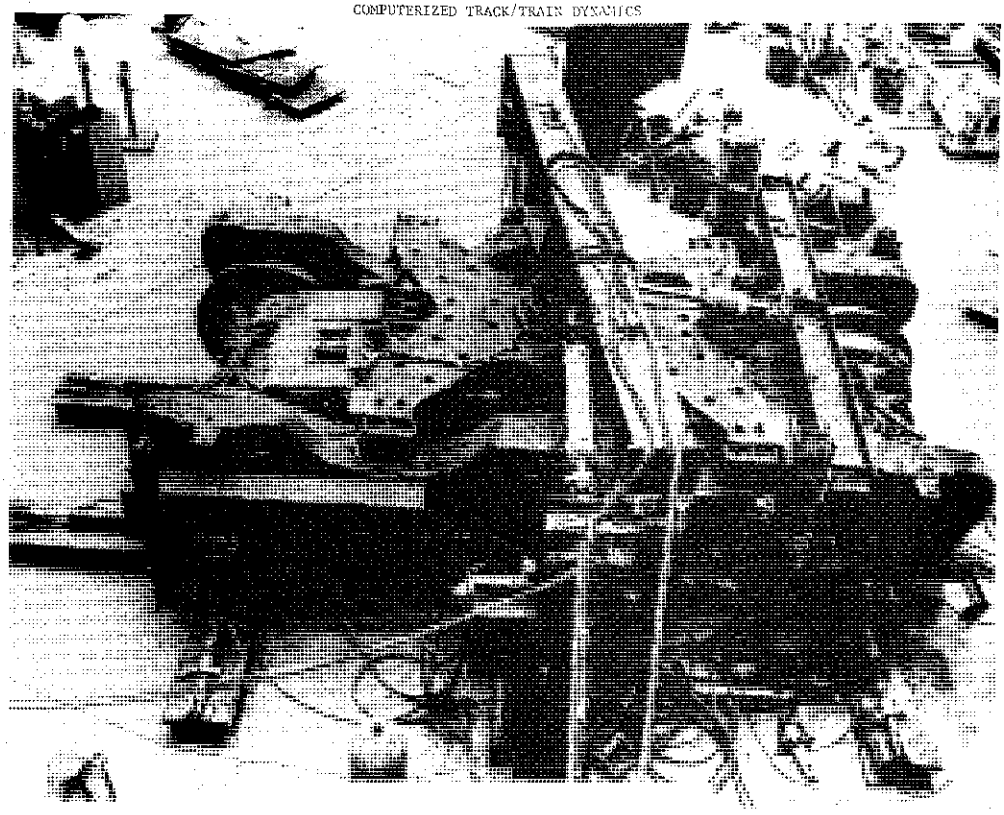


FIGURE 6

NASA Tech Brief

National Aeronautics and Space Administration

Marshall Space Flight Center, Alabama

Fresnel-Lens Solar-Energy Concentrator

Theoretical and experimental evaluations are described.

An analytical and experimental evaluation of a plastic Fresnel lens has produced lens and concentrator data that help to improve collector performance. In addition, the methodology described in the report will be useful to the designers of other Fresnel-lens solar concentrators.

A grooves-down planocylindrical collector lens of compression-molded optical-grade methyl methacrylate was the test subject. The lens was 22 by 15 in. (56 by 38 cm) in size and had a groove density of 34.5 per in. (13.6 per cm), a center thickness of 0.171 in. (0.434 cm), an F number of 1.0, and a design wavelenght of 5,893 Å.

In the analytical study, Snell's law and Fresnel formulas were used to determine the groove angle and the total fraction of incident Sunlight transmitted through the lens. The concentrated solar energy at a position beneath the lens was calculated by summing the intensity contributions from each serration and for each wavelength interval of the solar spectrum. A computer program was then used to develop performance data for the Fresnel lens under study. These data included lens-transmission and focal-plane-intensity profiles for various wavelengths and amounts of defocusing.

The experimental evaluation was conducted by using natural Sunlight reflected from a tracking heliostat to maintain a constant angle of radiation incidence. Tests were conducted at Marshall Space Flight Center in Alabama from 10 a.m. to 2 p.m. on cloudless days to minimize variations in incident flux intensity.

As a result of these studies, several conclusions were drawn. The analytical baseline profile indicated that the refraction of wavelengths far removed from the design wavelength is the primary factor determining the image width.

A baseline peak concentration of 57 and a 90-percent target width of 1.4 cm were calculated for the 56-cm lens. The measured concentration and target width were 47 and 3.6 cm, respectively. Spreading at the experimental profile base resulted in a lower concentration and an increased image width relative to the analytical baseline.

Manufacturing modifications satisfactorily corrected the profile-spreading difficulty. Preliminary testing with a second-generation lens indicated a marked reduction in profile spreading.

The sensitivity of image properties to small transverse tracking errors (<1°) was low. The primary effect was the lateral shift of the profile and a corresponding increase in interception target width. The reduction of peak concentration ratio and increased profile skewness occurred for greater misalinement.

For deviations of 5° or less, longitudinal orientation effects on lens performance were insignificant.

High lens transmittance was computed (87 percent) and measured (85 percent) and was not significantly affected within the range of tracking errors evaluated.

Slight defocusing can result in more desirable profile characteristics from a thermal design standpoint, i.e., equal energy interception can occur with decreased thermal gradients.

This work was done by Steve L. Allums and Leon J. Hastings of **Marshall Space Flight Center** *and Ronald M. Cosby of Ball State University. To learn how to obtain a copy of the report, Circle 46 on the TSP Request Card.*
MFS-23575

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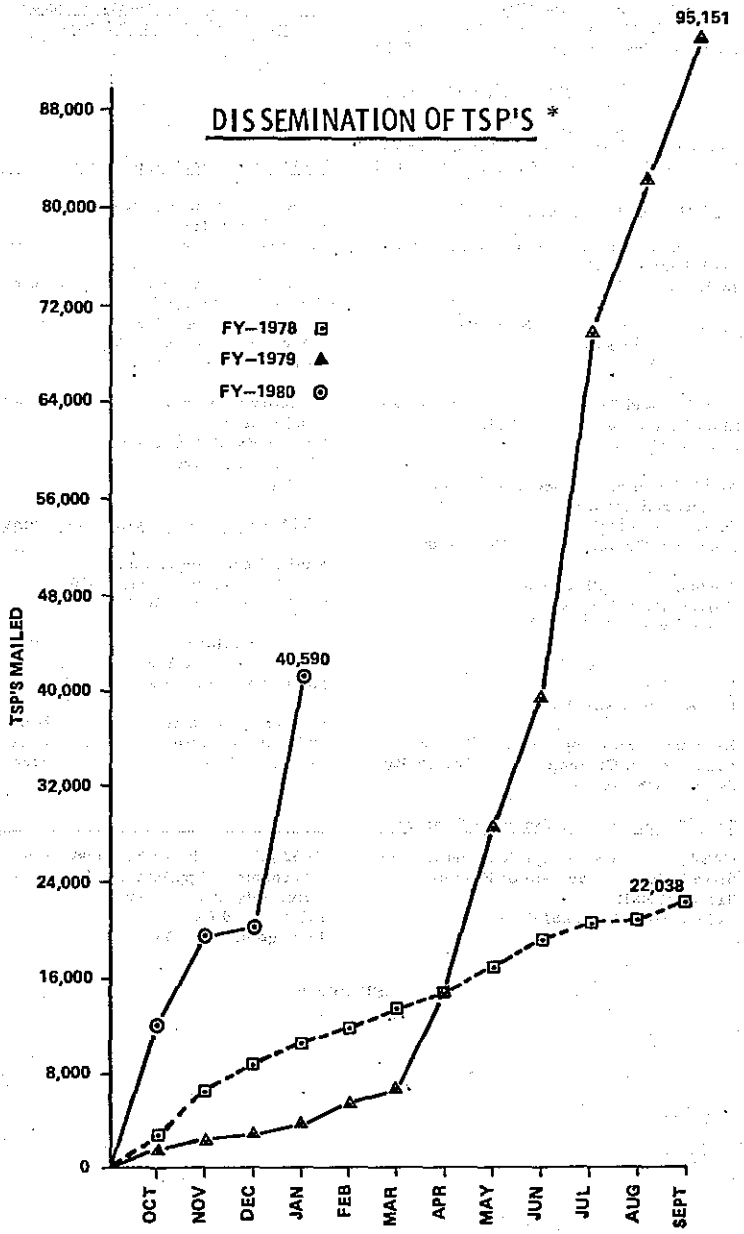
FIGURE 7

2760-79



*Technical Support Packages

FIGURE 8

TECHNOLOGY TRANSFER NETWORK

Technology Utilization Office
George C. Marshall Space Flight Center
Marshall Space Flight Center, AL 35812

Remote Sensing Liaison & Dissemination

Technology Utilization Office
George C. Marshall Space Flight Center
Marshall Space Flight Center, AL 35812

Industrial Applications Centers

Aerospace Research Applications Center
1201 East 38th Street
Indianapolis, IN 46205

Knowledge Availability Systems Center
University of Pittsburgh
Pittsburgh, PA 15260

New England Research Applications Center
Mansfield Professional Park
Storrs, CT 06268

North Carolina Science & Technology
Research Center
P. O. Box 12235
Research Triangle Park, NC 27709

Technology Applications Center
University of New Mexico
Albuquerque, NM 87131

Western Research Applications Center
University of Southern California
Los Angeles, CA 90007

Kerr Industrial Applications Center
Southeastern Oklahoma State University
Durant, OK 74701

Computer Software Management and
Information Center (COSMIC)

COSMIC
112 Barrow Hall
University of Georgia
Athens, GA 30602

NASA Biomedical Application Teams

Research Triangle Institute
P. O. Box 12194
Research Triangle Park, NC 27709

Stanford University School of Medicine
Cardiology Division
Biomedical Technology Transfer
701 Welch Road, Suite 3303
Palo Alto, CA 94303

Advisory Center for Medical Technology
and Systems
University of Wisconsin
1500 Johnson Drive
Madison, WI 53706

NASA Technology Application Teams

Public Technology, Inc.
1140 Connecticut Avenue, NW
Washington, DC 20036

SRI International
333 Ravenswood Avenue
Menlo Park, CA 94026
-For transfers to transportation industry & agencies.

IIT Research Institute
10 West 35th Street
Chicago, IL 60616
-For transfers to manufacturing and processes industries.

State Technology Applications Centers

NASA/Florida State Applications Center
State University System of Florida
311 Weil Hall
Gainesville, FL 32611

NASA/University of Kentucky State
Technology Applications Program
University of Kentucky
109 Kinkead Hall
Lexington, KY 40506

FIGURE 9

March 14, 1980

STATEMENT

of

MR. JYLES MACHEN
SMALL BUSINESS AND INDUSTRY ASSISTANCE OFFICER
MARSHALL SPACE FLIGHT CENTER
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

for the

SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT
COMMITTEE ON SCIENCE AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

Mr. Chairman and Members of the Committee:

I wish to thank the committee for the opportunity to present the efforts that the small business office at Marshall Space Flight Center (MSFC) is making to ensure participation by small high technology firms in the Center's programs.

At Marshall great importance is attached to small business participation in research and development. While the Center's primary mission is major systems acquisitions, Center management, program offices and technical directorate personnel give considerable time to keeping the small business program highly visible resulting in effective support.

The Center Director and all of top management at MSFC receive a monthly briefing at the Center Director's staff meeting on the status of the small business program. Each organization's dollar obligations to the small business goal are provided monthly by a computer report.

The Small Business Specialist and Minority Business Specialist are assigned full-time primary duties for implementation of the small business program. A Small Business Technical Advisor, who is an engineer in the Science and Engineering Directorate, has as a primary duty the support of the Small Business Administration's full-time Procurement Center Representative and the Center's Small Business Specialist. The Small Business Technical Advisor assures that small business has a fair opportunity to compete by reviewing high technology procurements for set-aside and addition of sources in support of final action by the Small Business Specialist.

The source list of small business vendors with research and development capability is maintained in the Procurement Office at this Center. It is updated monthly by addition of new sources and purged of sources no longer in business on a continuing basis. Copies of the source list are supplied to contracting officers, small business coordinators, program offices and the Science and Engineering Directorate Offices and laboratories.

The list contains 816 small business firms with R&D capability from throughout the U.S.; more than 60 are located in the immediate area of MSFC.

In support of the small business program and with an appreciation for the value of awards to small high technology firms, the Science and Engineering Directorate (S&E) provides a system of small business coordinators in the S&E Associate Director for Management Office and in each of eight laboratories. This organizational structure gives a direct interface and immediate access for support in origination of awards with small R&D companies. From S&E in FY79 awards totaling $9,421,000 were placed with small business.

At MSFC several approaches are used to ensure small firms are afforded an equitable opportunity to participate in the contracts awarded.

One approach which enhances the atmosphere at MSFC for small business awards is the establishing of a small business goal. Prior to the beginning of each fiscal year, all program offices and directorates having procurement requirements submit, at the Center Director's request, a projection of their expected small business awards for the year.

A plan to achieve the goal (Attachment 1), the combined total of the projection and its percentage of all business awards, is submitted to NASA Headquarters for review for consistency with the agency goal.

It has been this Center's policy to set the small business goal high enough to create a need to make a conscious effort for achievement. This is a particularly difficult task at a center which has multiple large prime contractors engaged on a long-term contractual basis to supply R&D resulting in major systems hardware.

Over a period of 20 years, the small business percentage of total business awards has declined or risen in inverse proportion to decreased and increased major systems

acquisition (see Attachment 2). However, the value of a small business goal as an incentive to spur greater achievement is recognized at this Center as a valuable tool.

Another approach to ensure R&D dollars for small business is the set-aside program. In FY79, $7,351,000 or 21.3% of total small business awards were set aside exclusively for small business competition.

All procurements of $2,500 or more are reviewed by the small business specialist for inclusion of capable small business firms in the solicitation of bids and proposals and for set-aside potential. Public Law 95-507 now reserves for small business all awards under $10,000 which are subject to small purchase procedures if two or more competitors offer fair prices in terms of quality and delivery of the goods or services being purchased.

While more than 300 set-asides were made in FY79, one significant high technology set aside for small business was a requirement for two flight horizon sensors, along with ground test equipment, needed by the Spacelab Payload Project. The award went to Ithaco, Inc. of Ithica, New York for a total of $612,879.

The 8(a) program, which offers the possibility of a negotiated procurement with a firm owned by socially and economically disadvantaged individuals, can also be used to acquire services from high technology small business. Currently, MSFC has an 8(a) contractual relationship with five minority-owned small high technology businesses totaling $2,010,000. However, the very nature of the factors which determine eligibility for certification by the Small Business Administration limits the number of high technology firms which are eligible as 8(a) contractors. Total 8(a) awards at the Center for FY79 were $5,509,000.

An often overlooked avenue to NASA R&D awards for small high technology firms is the submission of an unsolicited proposal. Clearly a firm must have keen judgment to determine high priority mission requirements compatible with the firms expertise which also offer the possibility of available funding. At MSFC small R&D firms are encouraged to use this access route. In FY79, 33 unsolicited proposals were received from business and 15 were funded. Of the funded proposals 5 were from small high technology firms.

As a result of an unsolicited proposal from a small high technology firm, the Benton Corporation of Manor, Pennsylvania, the Electronics and Control Laboratory at

MSFC has requested a contract for $198,000 be negotiated for design and fabrication of two complete Coal Face Measuring Systems for underground use.

Within the last 30 days, various offices at MSFC have written sole source justifications to 7 small high technology firms totaling more than $550,000.

Strict Center requirements for documentation limit this type of procurement but with adequate justification, knowledgeable technical personnel can utilize small R&D expertise by a sole source justification.

Public Law 95-507 approved by the 95th Congress and signed by the President on October 24, 1978, is now being implemented by NASA and the Marshall Space Flight Center. This amendment to the Small Business Act requires all solicitations for negotiated and advertised procurements, which may exceed $500,000 and offers subcontracting possibilities, to contain a clause requiring submission of a subcontracting plan by the successful offeror. A contract general provision sets forth the policy that small and small disadvantaged firms shall have the maximum practicable opportunity, within the judgment of the contracting officer, to participate as subcontractors in the performance of prime contracts. The full impact of this new law on small business subcontracting has not yet been determined as its implementation began in October 1979.

However, the potential for increased small business subcontracting by MSFC prime contractors is great. In the review of subcontracting plans submitted to the contracting officer, the small business specialist will have the opportunity to advise on adequacy of the plan and make recommendations for additional subcontracting to high technology small firms.

In requests for proposals where substantial subcontracting possibilities exist, a percentage goal may be established for small business subcontracting. A successful proposer must negotiate a definitized subcontracting plan which will become a part of the contract. In recognition of extraordinary efforts by the contractor in exceeding small and small disadvantaged subcontracting goals, the contracting officer may pay an award fee not to exceed 10% of the total dollar value of all subcontract awards in excess of the goal. This incentive can be a valuable asset for increased subcontracting to small business.

The nature of major system acquisitions at MSFC makes it necessary to go to large aerospace firms to achieve successfully integrated systems requirements. Since the bulk of funds are then concentrated with large primes, small business subcontracting performance at a maximum level compatible with good business management is a vital element to ensure small high technology firms' participation in the programs.

In FY79 MSFC had 894 prime contracts of over $10,000 amounting to $700,000,000. Of this total, 362 were to small business primes for $35,000,000 or 5 percent of total dollar awards, while another 7 percent of MSFC dollars or $49,000,000 went to small business subcontractors. Examples of FY79 prime contract awards to small high technology firms are shown on Attachment 3.

In FY79 NASA Administrator, Dr. Robert A. Frosch, established a NASA Small Business Initiative to increase the base of small business involvement in research and technology programs. Three NASA Headquarters' Program Offices established field center goals for awards to small high technology firms. At MSFC 103 contracts and purchases were made in response to the Initiative totaling $1,276,900.

In the solar area, MSFC worked directly with the Department of Energy to make awards for building energy systems for heating and cooling. A total of 41 contracts were awarded by MSFC with 35 of the awards going to small business firms representing 85% of the total number of awards for Site Demonstration Systems.

Another success story at MSFC is in the Materials Processing in Space Projects Office (MPS). Total projected awards to business for FY80 in MPS are $9,193,000 with 10.9% of these awards planned for small high technology firms for a total of $1,005,000. During the first quarter of the fiscal year, MPS has made 79 awards totaling $662,207 to small high technology firms. First quarter awards by MPS already exceed their achievement of $512,000 for small business in FY79.

One of the most dramatic examples of technology transfer at MSFC relates to the Power Factor Controller (PFC). An MSFC technical employee received the Excaliber Award from the U.S. House of Representatives for developing this energy saving attachment to regulate power usage in electric motors. To date, 98 companies have been licensed to manufacture this product. Acceptance of the potential for the PFC is evidenced by the 15,000 public and industry inquiries made to the Center's Technology Utilization Office.

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To continue to refine the manufacturing and commercialization of the PFC, two competitive cost sharing awards were made to small high technology firms in September of 1979. One award was to Electronic Relays, Inc. in Illinois for $68,082 with the contractors share to be $32,420 while the second award was to Iveco in California for $106,754 with the contractor share to be $71,444. These contractors are helping to develop the 3-phase unit; to improve the single-phase unit, and to provide units for NASA and DOE use. Information gained from these two field studies will offer other licensees support in their efforts to manufacture the PFC and develop a marketing system.

As described above, this Center has a conducive climate to involve small business in a growing measure in R&D programs. The Center has a direct and vital interest in capitalizing on the creativity of the small business entrepreneur.

The Federal Government's contribution to the Nation's R&D total market is significant, and to recognize the role of Government procurement in strengthening small business innovation potential is essential. Statistical data developed in recent congressional hearings is in strong support of the fact that small firms produce more major innovations per R&D dollar expended than do large firms.

Federal procurement plays a catalytic and pacing role to bring Government-developed products and standards into commercial application ranging from auto safety, to energy conservation, to communication, to health, and even to fire prevention and control.

While the initial aim of R&D procurement is to meet agency mission assignments, Government-funded R&D has helped to attain other important national goals and to provide a broad base of scientific knowledge and trained manpower in large and small businesses and in our nation's universities and laboratories.

We at MSFC believe the record supports our awareness of the essential role occupied by the small innovative high technology business community in our nation. It is the desire of the men and women at this Center to accomplish the agency's mission assignment in concert with support for small business. We applaud the committee's task, in pursuit of the nation's welfare, to define the impact of federal R&D funds on small high technology firms.

MSFC Plan for Achievement of
FY-80 Small Business Goals

1. Each directorate and program/project office has reviewed FY-80 planned procurements for expected small business participation. These reviews produced projected FY-80 small business plans by user with total dollars of $35,892,000.

2. The Small Business Office will receive a monthly printout in order to monitor small business procurements by user elements with the Center. These printouts will be provided to the users who will update their small business plans at the beginning of each fiscal quarter.

3. Small Business computerized reports have been expanded to show small business and large business awards by program code and cog activity.

4. The Center Director will receive a monthly small business status report and a profile on the origin of small business dollars at MSFC.

5. Small business coordinators also will receive monthly status and origin reports on small business.

6. The MSFC Small and Minority Business Council will monitor the small business program, maintaining emphasis on small business R&D at the highest level of management.

7. The Small Business Office will use an updated analysis of committed funds to ongoing large prime contractors in order to place emphases on other procurements where there is small business potential.

8. Class set-asides for refuse collection, janitorial, and base maintenance contracts remain in effect.

9. Common Shuttle Support Equipment will be procured directly by Marshall where feasible.

10. The Small Business Office will review each procurement for potential set-asides and also add small business sources to bid lists to increase small business opportunities on competitive procurements.

11. Procurements will be reviewed for potential labor surplus set-asides and the Women's Business Enterprise Program will be implemented in accordance with NASA policies and procedures.

ATTACHMENT 1

MSFC HISTORICAL STATISTICS 1961 - 1979

FY		AWARDED TO TOTAL BUSINESS		AWARDED TO SMALL BUSINESS		% AWARDED TO SMALL BUSINESS	GOAL
61		$ 128,418		$23,535		18.3	-
62		477,683		38,980		9.7	-
63		766,513		57,660		7.5	-
64		1,242,319		67,629		5.4	-
65		1,589,261		83,155		5.2	-
66		1,527,979		63,790		4.2	-
67		1,258,816		55,549		4.4	-
68		1,030,826		44,979		4.4	-
69		746,020		32,304		4.3	-
70		698,874		31,820		4.6	-
71		636,514		35,962		5.6	-
72		633,292		28,460		4.4	-
73		488,504		23,974		4.7	-
74		322,333		19,216		6.0	-
75		314,805		31,462		10.0	-
76		409,581		40,740		10.0	None
77		505,130		41,029		8.1	10.5
78		608,012		36,000		5.9	9.5
79		702,703		35,000		5.0	6.5
80	Estimate	834,646	Projected	37,000	Projected	4.4	5.0
			Assigned	41,700	Assigned	5.0	

Attachment 2

Marshall Space Flight Center
Small High Technology Awards FY79
$50,000 and Above

Name of Company	Description of Service	Amount of Awards
Floating Point Sys Inc.	Array Computer Processors	$ 65,593
AS&E (4)	HEAO Mission B/X-Ray Telescope Experiment	780,211
Remtech, Inc.	External Tank/SRB Aerothermal Flight Studies	280,651
M&S Computing, Inc. (18)	Maint. & R&D on Computing Equip./Graphics terminals/ other electronic equip.	1,481,151
Harmon & Assoc, Inc.	Control Analysis of Materials	204,930
Eldec Corp	Mfgr. Signal Conditioner/SRB Electronic Assy	120,440
Arkmin Industries	Flight qualified hydraulic reservoirs for SRB	105,550
Arde, Inc.	Design, testing & delivery of Hydraulic Fuel Supply Modules	377,000
Hi Shear Corp (2)	Design, Mfgr & delivery of Solid Rocket Pyrotechnic Components	1,067,540
Essex Corp (5)	Studies/Large Space Structures	418,158
Intersonics, Inc. (2)	Ground Support & Special Test Equipment	262,526
Data Processing Assoc.	Solid Rocket Booster Cost Models	168,140
Shaker Research Corp.	Spacelab Mission I Experiments	76,162
New Tech, Inc. (4)	Reactivation & Support of the HOSC Real Time System	714,456
Ilene Industries, Inc. (8)	Various modules; computer terminal systems & peripheral replacements	486,632
Intermetrics (3)	Research Studies/NSSC-II Operating Systems Rqmts	296,285
Atmospheric Environ Res	Study - Acoustic Heating & Forced Convection in Solar Corona	50,000
Physical Science, Inc	Studies - Laser Heated Thruster	114,863
TAI Corp (3)	Studies: Holographic Automation Techniques	66,403
Guest Assoc. Inc. (2)	Studies: Growth of Solid Solutions Semiconductors	85,176
Am Mech & Elect Service	Design & fabrication of a Remote Manipulator System	50,000
Ithaco, Inc.	Horizon Sensors for Spacelab Payloads	587,071
Lasser Research	Design, fabrication & delivery of Preload Doppler Lidar Signal Processor	93,366
Hydranautics, Inc.	Space Shuttle Main Engine Blade Material Fatigue Testing	74,563
Transolar, Inc.	Solar Heating & Cooling Concentrator	98,272
FWG Associates (4)	Feasibility Studies - Low Level Wind Shear	108,047
Bjorksten Res. Lab	Upgrading of Glass Microbalance	50,000
Espee, Inc. (2)	Evaluation of Autoradiographics	50,000
System Planning Corp	Applications Analysis/Mats Processing in Space	60,000
DCA Reliability Lab	Test, Evaluation & Analysis of Parts	363,888
Schenck Trebel Corp	Mfgr Static & Dynamic Horizontal Bal Machine	50,645

NOTE: Does not include Const., A/E, or Support Contracts.
() Number or Contracts

Attachment 3

Answers to Questions Asked of DOE

Question 1: How much money has been set aside for unsolicited proposals?

Answer: In fiscal year 1979, the Department of Energy (DOE) established the first Federal reserve for exclusive support of unsolicited proposals submitted by small or disadvantaged business concerns. The following Secretarial program offices signed agreements with the Procurement and Contracts Management Directorate under which the following amounts were reserved in fiscal years 1979 and 1980.

Question:

a. This fiscal year?

		Reserved
Answer:	Office of Energy Research	$ 1,000,000
	Office of Fossil Energy	$250,000
	* Office of Conservation and Solar Energy	$300,000

Question:

b. The past fiscal year?

		Reserved	Obligated
Answer:	Office of Energy Research	$300,000	$267,000
	** Office of Energy Technology	$750,000	$272,000
	Conservation and Solar Energy	$1,000,000	***

c. Why the decrease in funding?

Answer: Funding levels in Energy Research increased from $300,000 in fiscal year 1979 to $1 million in fiscal year 1980. Fossil Energy support, included in Energy Technology during fiscal year 1979, rose from $200,000 in fiscal year 1979 to $250,000 in fiscal year 1980. The overall decline of $.5 million between fiscal years 1979 and 1980 is largely attributable to three factors:

* Notice of Program Interest released to Commerce Business Daily week of July 25, 1980.

** Office abolished; functions transferred.

*** Conservation and Solar accounting records do not reveal unsolicited proposals separately funded under the reserve. In fiscal year 1979, reserve awards were commingled with funding for other unsolicited proposals.

(1) Nuclear Energy support ($150,000) was discontinued in fiscal year 1980. In fiscal year 1979, only one proposal was received, which was not approved for support.

(2) Magnetic Fusion support ($200,000) was discontinued in fiscal year 1980. In fiscal year 1979, no unsolicited proposals were received.

(3) Conservation and Solar Energy support declined from $1 million to $300,000.

Question:

d. How much money has been awarded this fiscal year?

Answer: Unsolicited proposals selected for funding are in evaluation or processing of award. Complete data on obligations will be available approximately 60 days after fiscal year end.

Question:

e. How much money was awarded the past fiscal year?

Answer: See obligations under b.

Question 2: How many unsolicited proposals did you receive?

a. This fiscal year?

Answer: 2,250

Question:

b. The past fiscal year?

Answer: 2,850

Question:

c. How are they evaluated?

Answer: The evaluation criteria used in reviewing unsolicited proposals are contingent upon whether the program for which the proposal is to be considered is principally one of acquisition or assistance.

(1) If the program is principally one of acquisition, the supporting instrument will be a contract. The evaluation criteria for contracts are set forth in the Department of Energy (DOE) Procurement Regulations (PR) 9-4.909 (d), Federal Procurement Regulations (FPR) 1-4.909 (d), and special research contracts DOE PR 9-4.5106.2. *

(2) If the program is principally one of assistance, the supporting instrument will be an assistance agreement, i.e., a grant, a cooperative agreement, a direct loan, or a loan guaranty. The evaluation criteria for assistance agreements are set forth in Assistance Regulations (AR) 600.34 (h), (i), and (j).*

Question:

d. Is there any reluctance on DOE's part to process these proposals?

Answer: Because present and future needs demand fullest possible use of all resources in exploring alternative energy sources and technologies, it is DOE's policy to stress the value of obtaining external sources of unique innovative methods, approaches, and ideas through unsolicited proposals while preserving the integrity of the procurement process through the applications of reasonable controls. In furtherance of this policy, DOE will:

(1) Disseminate information on areas of broad technical concern whose solutions are considered relevant to the accomplishment of DOE's mission.

(2) Encourage potential proposers to consult with program personnel before expending resources in the development of written unsolicited proposals.

(3) Endeavor to distribute unsolicited proposals to all interested organizations within DOE.

(4) Process unsolicited proposals in an expeditious manner and, where practicable, keep proposers advised as discrete decisions are made.

(5) Assure that each proposal is evaluated in a fair and objective manner.

(6) Assure that each proposal will be used only for its intended purpose and the information contained therein will not be divulged without prior permission of the proposer.

* Regulations cited are contained in DOE Order 4210.4--"Policy and Procedures on Unsolicited Proposals." Copy attached.

Question 3: In your solar photovoltaic programs, 10 percent has been set-aside for small firms.

a. Isn't it true that small, high technology firms have the greatest capability to contribute in this area?

Answer: DOE recognizes the significant contribution that small, high-technology firms can make to the development of solar technologies, including photovoltaics. In fiscal year 1980, almost 12 percent of total photovoltaic funds expended went to small and minority businesses, and over 15 percent in terms of the number of private contracts issued. While DOE attempts to award contracts to small concerns whenever possible, some contracts must be awarded to organizations, regardless of size, that possess the highest degree of technical or managerial expertise which is necessary to accomplish a particular task or research project. Some projects also require greater financial resources that only larger companies possess.

Question:

b. Why isn't the percentage higher?

Answer:

The Solar Photovoltaic Research, Development and Demonstration Act of 1978 stipulates a 10 percent set-aside for small businesses. The steadily increasing percentage of solar funds going to small businesses has exceeded this Congressionally mandated figure. The photovoltaics program is taking the following steps to assist small and minority businesses:

- The "set-aside" principle is being applied where appropriate. For example, total funds authorized in Cycles 1 and 2 of the Federal Photovoltaic Utilization Program (FFUP) are set aside for small and minority businesses.

- Small and minority business goals are employed in some instances. In the $20 million photovoltaic systems experiment Program Research and Development Announcement (PRDA) effort, a 20 percent goal has resulted in 22 percent of the funds going to small and minority firms.

- Within the advanced research and development subprogram, a special Innovative Concepts endeavor has been established, the purpose of which is to fund new and promising technical efforts of merit submitted by small and minority entrepreneurs. Proposals (less than 15 pages each) are collected every six months. This effort, which is administered by the Solar Energy Research Institute, is renewed every six months on an "open book" or de novo basis.

- Close contact is maintained with the Solar Energy Industries Association (SEIA) in order to maintain contact with small, new firms and the entrepreneurial element in general. The Photovoltaics Division of SEIA is headed by Bob Willia, who is President of a small business firm, Solenergy Corporation.

- Through a $1.2 million contract with the San Bernadino Development Corporation, a special minority photovoltaic educational program is training minorities in the technical principles of photovoltaics, including both the developmental and the applications aspects of this expanding technology.

The foregoing efforts to promote and maintain small and minority participation reinforce each other in diverse ways and contribute to the overall successes achieved to date.

c. Is it true that only 30 companies have received more than 97 percent of all solar energy research funds allocated by DOE?

Answer: Present statistica regarding the DOE allocation of solar research funds fail to substantiate this statement. As part of a recent study, a survey was taken on the disbursement of $529,960,000 of available solar procurement funding ((research and development (R&D) and other)) in the fiscal year 1980 budget. Of the total budget, we have been able to break out the number of firms doing substantive solar R&D with us and that number amounts to more than 830 separate small businesses doing direct and innovative R&D work with a contract value of $65,850,000 and a total percentage of our budget of almost 12.5 percent.

Question 4:

a. In the Geothermal Loan Guaranty Program, $30 million has been set-aside for small business financial assistance. What is the total funding for the geothermal program?

Answer: The Geothermal Loan Guaranty Program currently has authority to enter into $350 million in loan guaranties through fiscal year 1980. In fiscal year 1981, we are requesting another $206 million for the program.

Question:

b. How much money has been allocated to the electric and hybrid vehicle program?

Answer: The total funding for the Electric and Hybrid Vehicle Program fiscal year has been fiscal year 1979--$36,691,000; fiscal year 1980--$41,780,000; and fiscal year 1981 budget request--$42,980,000. A part of Electric and Hybrid Vehicle Program is a Loan Guaranty Program (not exclusive for small business). The authorized ceiling for the Loan Guaranty Program has been established at $16 million by the House Appropriations Committee. Funds actually appropriated for deposit in the loan guaranty default fund are $2.85 million as of fiscal year 1980.

Question 5: How much money has been allocated to the Alternative Fuels Commercialization Program? Has any money been set-aside particularly for small business?

Answer: A total of $5.5 billion has been made available to the Department under two appropriations to stimulate the commercial production of alternative fuels. Public Law 96-126 appropriated $2.2 billion under the authority of the Federal Energy Non-Nuclear Research and Development Act of 1974, as amended. An additional $3.3 billion was appropriated in supplemental fiscal year 1980 funds--$3 billion under the authority of the Defense Production Act, as amended, and $300 million under the Non-Nuclear Act. These funds were allocated in four financial incentive categories of loan guaranties, price guaranties/purchase commitments, feasibility study grants, and cooperative agreements.

No monies have been specifically set-aside for small business. The initial feasibility study and cooperative agreement solicitations issued by the Department on February 25, 1980, however, contained a "Program Policy Factor" to be applied during proposal evaluation which stated that the Department would specifically consider the extent to which small and disadvantaged business and/or Indian tribes were involved in the project. In the $200 million of awards announced on July 9, 1980, an aggregate of almost $22 million was granted to small businesses. This figure represents grants to prime contractors and does not include any small business involvement in subcontracts.

The Department will have a comparable Program Policy Factor incorporated in the upcoming second round of feasiblity study and cooperative agreement solicitations for which $300 million will be available.

Question 6: How much money has been awarded to small business under the appropriate technology grant program? How many grants have been awarded? What is the maximum amount for each grant?

Answer: Under the fiscal year 1979 Appropriate Technology Program, $2,079,000 out of $8 million was awarded to small business. One hundred and twenty-eight grants were awarded to small business in fiscal year 1979. Fifty thousand dollars is the maximum amount that can be awarded over a 2-year period.

Queation 7: How effective is the Energy Related Inventions Program where inventors submit concepts to the National Bureau of Standards (NBS) for evaluation? How many proposals have been submitted? How many have been found meritorious? How many were funded?

Answer: The effectiveness of Government programs is customarily measured against the standards of: efficient use of financial resources; ability to meet technical or programmatic goals; and the appropriateness of the program as a benefit to society. The Inventions Program measures well against these criteria.

The July 1980 issue of MIT Technology Review features an article titled "Paving the Way for Energy-Saving Innovations." The authors, Jansson and Newton, quantitatively reviewed the program in terms of these same criteria and concluded that this program was very effective in the performance of its tasks. The authors measured: return on investment, BBL of oil/day-equivalent, changes in technological level and stage of development, present value of energy saved (societal return), and market prospects.

The Program has undertaken the evaluation of inventions ranging from basic research ideas, to assistance with development and commercialization of marketable, energy-saving products. It has backed projects ranging from high technological risk to proven, but yet to be marketed, products.

The Invention Division is presently negotiating a contract for a program evaluation which will review all aspects of the program in great detail. Furthermore, an internal, retrospective analysis, of more limited scope, will be performed for the specific use of the program manager in his constant evaluation of program efficiency.

All of the inventions referred to DOE by NBS are funded, unless the inventor himself expresses a desire to exit the program at this point, with his NBS recommendation in hand--or unless an unforseen change of events, e.g., bankruptcy, changes the basis on which the invention was originally evaluated. Negotiation of the terms and conditions of a grant suitable to the inventor and the Government are time consuming. Therefore, although 135 inventors have been recommended to DOE by NBS, the program office has been able to negotiate a total of 48 awards as of April 30, 1980. Twenty-four grantees have completed their work, 53 inventions are in various stages of negotiations, and unfortunately 10 other prospective grantees will not be funded for the reasons previously mentioned.

In the same cumulative time frame, 6,853 requests for evaluation have been accepted for evaluation by NBS, 523 of these were candidates for second stage evaluation, and 135 have been recommended to DOE. The remaining 388 are in process at NBS.

A total of $4,144,134 in direct grants had been made at the close of business December 31, 1979. In addition, assistance other than direct financial support has been given to four inventors. All applicants to the program receive technical advice and evaluation by competent experts, which is of considerable value to the prospective grantee.

Question 8: Describe the Procurement Automated Source Syatem (PASS).

Answer: The Small Business Administration (SBA), with the support of DOE, developed and operated the PASS to increase Government contract and subcontract opportunities for small businesses. PASS is designed to respond to the requests of Government agencies and the private sector for profiles of potential bidders. It permits small firms registered with PASS to have their capabilities made available when specific source requests are made by Federal procurement officers and other buyers.

The PASS data base is divided into four separate files: research and development, manufacturing, construction, and services. Small firms are retrieved from the data base by the use of key words and key fields. The system is capable of searching more than 7,000 key words. Some of the fields are minority and female ownership, Labor Surplus Area (LSA), 8(a), bonding level, operating radius, and geographic location by city, State, and Federal region.

Currently, there are 30,678 small firms "on-line" in PASS. We are continuing our outreach effort to enroll all small firms that are interested in Government contracting or subcontracting opportunities.

Question:

a. Is it truly effective?

Answer: The system has been on-line for over a year and is working well. During the first year of operation, 33,696 searches were made and 108,230 profiles of small firms were displayed. Small business set-asides have been made as a result of sources obtained from PASS. In addition, contracts have been awarded to PASS registrants. Precise accounting is not possible because the contracts are awarded by other Federal agencies, and the specific reason that the small firm received the solicitation is not always known. It may have resulted from the bidders' mailing list, PASS, a telephone request, personal contact, or a card file liating.

Remote terminals which can access the computerized data base are available at 41 locations, including SBA, DOE, and eight other Federal agencies. Due to the interest generated by PASS, we plan to expand significantly the number of terminals that can directly access the system. This expansion will include major prime contractors as well as other Federal agencies. An equitable cost sharing formula is being developed to accommodate the increased operating expenses.

Question:

b. How does a small, high technology firm put its name on the list?

Answer: Small firms interested in participating in PASS should complete and sign the PASS company profile (SBA Form 1167) which is available at all SBA offices. The firm describes its capabilities on the profile form and certifies that it is correct.

Question:

c. If a small firm submits an unsolicited proposal, is its name automatically placed in the PASS system?

Answer: The fact that a small firm submits an unsolicited proposal does not automatically place its name in PASS. Registration is a voluntary action that only the small firm can accomplish.

Question 9: Approximately $2.2 billion is allocated by DOE for R&D in Government-Owned, Contractor Operated (GOCO) laboratories.

a. How much is specifically allocated to small firms?

b. How much of that amount is specifically set-aside for subcontracts? Isn't it a very small amount?

Answer: (a & b) Approximately $2.2 billion was allocated by DOE for fiscal year 1979 for energy research and development (R&D) in Government-Owned, Contractor Operated (GOCO) laboratories. DOE does not specifically allocate or set aside R&D funds to the GOCOs for small business subcontracts. However, DOE does, as a part of its implementation of the small business program, assign small business goals at the beginning of each year to each procurement office and GOCO facility.

As an example, Argonne National Laboratory had a small business subcontracting goal of 30.8 percent in fiscal year 1979, and its small business obligations in fiscal year 1979 were over $37 million or 47.3 percent of available funds was awarded to small business. Similarly, Union Carbide Corporation--Nuclear Division had a goal of 38.6 percent, and $102 million or 40.8 percent of available funds was awarded to small business. Although some GOCO laboratories did not meet their goals, most did. Further, the goals given to each GOCO are significant, both in terms of dollars and percentage of available funds. Other examples of fiscal year 1979 awards to small businesses are:

1. Lawrence Livermore Laboratory (San Francisco Operations Office) $70 million (51%)
2. Lawrence Berkeley Laboratory (San Francisco Operations Office) $23 million (38%)
3. EG&G (Idaho Operations Office) $33 million (49%)
4. DuPont (Savannah River Operations Office) $51 million (39%)
5. Westinghouse (Fast Flux Test Facility Project Office) $15 million (53%)

Question:

c. Do GOCO laboratories conduct research that could be done by private firms? If so, what steps have been taken to minimize the use of GOCO laboratories to compete with work done by private firms?

Answer:

It is the policy of the Department to accomplish the Nation's energy research, development, and demonstration (RD&D) programs in universities, in industry, or at its laboratories based primarily on an objective judgment of where the work can best be done.

In general, universities bring special expertise in training of scientists and engineers for DOE's technology and research needs. They also carry out sophisticated research programs, particularly in areas involving the basic sciences and frontiers of knowledge.

Industry brings integration, fabrication, and practical economic skills in selected areas and provides and operates special facilities crucial to DOE's mission. But most importantly, it brings industrial expertise to bear on DOE's commercialization mission.

National laboratories bring sustained multidisciplinary skills to needed program areas, including the coupling of basic sciences to technological areas. They also provide continuity to long-term complex programs, and strong support for diverse, high-risk technology development, including emergency response.

In order to implement this policy, the Department has issued guidance as the basis for planning and assigning work to the laboratories. The task proposals are routinely reviewed by the program and operations offices to assure suitability vis-a-vis the guidance:

"Work may be placed in the laboratories (and otherwise shall be placed with either the university or private sectors) when such work:

- Requires use of skills or facilities uniquely available at the laboratories, or

- Is consistent with the Government's desire to maintain scientific staff core capabilities and/or long-term control of expensive facilities on a contract basis, or

- Is determined (after effort to seek private sector participation) not to be within the capability and interest of universities or industry to perform, or

- Requires a fast start-up or multidisciplinary approach not readily available in the private sector to meet an urgent R&D need."

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

August 28,1980

OFFICE OF THE DIRECTOR

Representative George Brown, Jr.,
Chairman
Subcommittee on Science, Research and Technology

Representative Jim Lloyd
Chairman
Subcommittee on Investigations and Oversight

Committee on Science and Technology
U.S. House of Representatives
Washington, D.C. 20515

Dear Messrs. Brown and Lloyd:

This is in response to your recent letter concerning a potential reorganization of the Foundation, and the effect it might have on support for applied research in general and the Small Business Innovation Research program in particular.

At its meeting in June, the National Science Board asked the Director to study and make recommendations concerning the possible establishment of an Engineering Directorate and the distribution of certain applied research programs throughout the Foundation. We are now engaged in studying and discussing the topic, but are not yet ready to recommend specific changes.

Answers to the four questions posed in your letter are based on our thinking at the present time and may be changed as we continue to consider reorganization options.

Question 1: "In view of the steadily decreasing funding for applied research since 1975, how will the proposed reorganization affect this funding? Does this mean that even less attention will be paid, particularly at high levels in NSF, to support for applied research?"

One goal of reorganizing would be to give more attention to, and more recognition and support for, applied research in all the research directorates of the Foundation. Each problem-focused research program (e.g., Earthquake Hazards Reduction) would remain as a cohesive entity. Funding of smaller individual investigator-initiated projects would become the responsibility of several directorates. For example, funding of applied biological and behavioral sciences projects that are not part of a problem-focused program would be handled by the Biological, Behavioral and Social Sciences Directorate along with its basic research projects.

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We see this as a means of encouraging scientists working on basic research projects to pursue potential lines of applied research. This appears to be consistent with the philosophy expressed in your Committee's report on the FY 1981 authorization bill, which emphasizes that "... the coupling of basic and applied research... be made as close, natural and spontaneous as possible." Funding of high quality applied research projects within our line programs would be made easier and we would expect that support for science-driven, investigator-initiated applied research would grow.

With regard to the overall level of funding for applied research in any given fiscal year, the total is influenced in large part by the amounts budgeted for problem-focused research programs. The budgets for this type of more organized, goal-driven applied research should fluctuate as older programs achieve their objectives and are phased out, and new problems are recognized that lead to the establishment of new programs. Thus, year-to-year comparisons of the overall funding total for applied science are, in our view, not very meaningful.

Question 2: "The applied research budget served as a base for the 12 1/2% small business requirement. How will this minimum be handled or is it being discouraged?"

In the event that responsibility for supporting applied research is distributed throughout the Foundation, we will establish a mechanism to track it and to make certain that an amount equivalent to that called for under current legislation is directed to small businesses.

Question 3: "The Small Business Innovation Research program has had broad access to the EAS staff to increase its effectiveness. It seems that there would be less incentive for staff in other Directorates to participate in the proposed reorganization."

We would intend to continue a highly visible Small Business Innovation Research program and to place it within the organization so that it will be able to communicate with and influence all research directorates.

Question 4: "Do you anticipate keeping the SBIR program as a line item at the proposed $6 million level in FY 1981?"

FY 1981 appropriations actions have not yet been completed, and the total that will be appropriated for all research programs is uncertain. Moreover, authorization and appropriation committees have made significant shifts in the proposed distribution of research funds -- for example, the Senate-passed authorization bill includes several Women in Science programs not included in the budget sent to Congress. Final decisions on funding levels will be made when the operating plan is established, after appropriations are made available. There is no intention to single out the SBIR program for a cut, although some proportional reduction may need to be taken in this and many other programs.

Again, I would like to note that these matters are still under study and it may be some time before reorganization decisions are made. My staff and I are available to discuss these matters with you and to answer any further questions.

Sincerely yours,

Donald N. Langenberg
Acting Director

Answers to Questions Asked of NASA

Written responses to questions submitted by Chairman Lloyd and Chairman Brown at a joint hearing before the Subcommittees on June 12, 1980.

QUESTION:

NASA has developed a sophisticated technology transfer mechanism through its Industrial Applications Centers (IACs).

a. Do these centers assist small firms in evaluating the technical information received?

b. Do these centers have the capability of providing relatively long-term one-on-one counseling with promising small, high technology firms?

c. Is there any follow-up action taken to determine if the technical information provided has been useful?

d. If some of the funds expended for the Industrial Applications Centers were added to the "seed-money" for procurement with small firms, would equal or better results in terms of technology transfer be attained?

ANSWER:

a. Yes. The results of computerized information searches performed to respond to questions posed by small firms are screened or evaluated by IAC technical staff members for relevance to the user's needs. The process not only targets potential solutions but saves time for the user by eliminating non-relevant material.

b. Whereas the IACs do not provide consulting services *per se*, many small firms develop long-term one-on-one relationships with specific IAC technical staff members as a means of fulfilling continuing information needs in particular areas.

c. The IACs routinely follow up with users to determine what benefits may have been derived from a particular IAC service, such as a retrospective literature search. This follow up normally occurs approximately six months after the provision of a service in order that the user have sufficient time to measure the utility of the IAC information.

d. Results in terms of technology transfer would likely be severely diminished. The infrastructure built into each of the IACs - amortized through NASA funding, host institution cost share, and nominal user contributions - could not be duplicated by providing incremental "seed money" to procurements with small firms. This infrastructure provides both cost/effective access to computer-readable data bases and a broad range of technical expertise within the IAC technical staffs and NASA field centers. Given these unique ingredients of the IAC program and costs of attempting to duplicate them, technology transfer to small firms could

suffer severely through the "seed-money" alternative. However, if "seed-money" were granted directly from other agencies to small firms and specifically earmarked for IAC services, the attendant results in technology transfer would be approximately the same.

CONCLUSIONS AND RECOMMENDATIONS

General

Conclusion

Small, high technology firms have compiled an enviable record of innovation. Hard evidence compiled over the last 15 years show that small firms have provided over half of the major technological innovations in this century and during the more recent 1953-1973 time period. These small firms have higher rates of productivity and create new jobs at far greater rates than do large firms. There is no longer a need for additional studies but a definite national need to incorporate the creativity and capability of small, high technology firms in fighting our Nation's declining rates of productivity and innovation.

Recommendation

The Federal Government should adopt integrated, interagency policies that will result in greater participation by small, high technology firms. The Federal Government must take the lead in simplifying procurement, patent, management and technical assistance, and tax policies that encourage the formation and growth of small, high technology firms.

Funding of Federal Research and Development

Conclusion

Small firms received only 3 1/2% of the total Federal R&D obligations. Yet small firms produce about 24 times as many innovations per R&D dollar as do large firms. Although Federal agencies have consistently told Congress they will make an effort to increase this percentage, this does not appear to have happened.

Recommendations

-Federal departments and agencies should increase their R&D expenditures to small firms 1% each year on prime awards until small firms are receiving 10%

of that agency's total research and development budget not conducted in the agency with the exception of basic research.

-The National Science Foundation's Small Business Innovation Research (SBIR) Program should be expanded. Each agency having an annual R&D budget in excess of $100 million should be required to set aside at least 1% of that R&D budget for use in a program similar to the National Science Foundation's Small Business Innovation Research Program.

-Research and development acquisition regulations for all Federal agencies should be uniform and simplified.

-Contract duration in the procurement cycle should be harmonized as much as possible to allow for continuity of effort among small, high technology firms and to improve early cash flow.

-Unsolicited proposals should be welcomed and dealt with fairly and quickly.

-Peer group review should be reassessed and used when only appropriate. Peer groups, if used, should also include members who are young and innovative.

-Task type agreements should be used which extend over the life of the project which are renewed annually.

-"Payment on Completion" clauses are detrimental to small firms and should be modified to encourage biweekly payments.

-There should be reasonable page limits and uniformity on proposals.

-Information services of the NASA Industrial Applications Centers, especially the computerized "state of the art" searches, should be made available to small R&D firms for proposal preparation.

-Management and technical assistance services should be made available for firms receiving procurement contracts.

Patent Policy

Conclusions

The Federal Patent Policy is one that is costly, time consuming and encourages litigation to establish the validity of a particular patent. Each agency tends to have its own patent policy which further inhibits the effective use of patents. The commercialization of patents funded by government-sponsored research, is almost non-existent. If many of these patents could be commercialized it would have a positive effect on our technological progress. The original funding would be recovered many times through new jobs and increased tax revenues.

Recommendations

-There should be a uniform patent policy among all Federal agencies.

-The small business working on government sponsored research should be given exclusive rights to the invention and be allowed to commercialize it within a reasonable amount of time. Government maintains its own rights including "march-in" rights.

-An effective policy should be established for the exclusive licensing of existing Federal patents to small business.

-Patent litigation procedures should be simplified so that they reduce cost and time. Judges should be appointed from those who have expertise in technical and patent related matters.

-If production of a product is involved, the process documents and detailed industrial-engineering documents should be made available to the small, high technology firms. Otherwise, the firm would have difficulty producing an acceptable product.

Federal Laboratories

Conclusions

The Federal Laboratories are an excellent source of technology transfer to industry. Through joint use of their facilities, the latest state-of-the art can be effectively transferred. In some instances, the Federal Laboratories do compete with the R&D being performed by other small, high technology firms.

Recommendations

-The Federal Laboratories should continue to expand their program of technology transfer through joint use of facilities, symposia, and technical briefs.

-The NASA Industrial Applications Centers as well as the NSF coordinated Federal Laboratory Consortium, should be considered as a viable "link" between the Federal Laboratories and the private business sector.

-Full-time residency programs for engineers from industry should be expanded.

-The "hands-on" approach to technology transfer should be encouraged at every opportunity.

-The Federal Laboratories should not compete with small, high technology firms in the performance of research and development or decide that once R&D is solicited, it should be done "in-house".

Management, Technical and Financial Assistance

Conclusions

Simplified methods for obtaining technical information are essential for the progress of a small, high technology firm. However, if the firm does not possess requisite management skills, and receive sufficient financial assistance, the small firm will not grow and most likely will not survive. Successful assistance programs require long-term commitment and involvement. Direct collaboration and working together or "hands-on" approach as it has been called has been very successful as has the transfer of people with the necessary knowledge.

Recommendations

-Small business development centers should be discouraged from using a quota system for making contacts with small firms. The centers should establish long-term relationships with small, high technology firms and use university scientists and engineers whenever possible.

-Technical assistance programs should have the capability of assisting the small firm in applying the technical information it receives. Working together or "hands-on" approach should be emphasized in using the technical information and/or new applications such as microprocessors. There should be a follow-up mechanism to insure the information and/or application has been effectively applied.

-Management and technical assistance should be made available to small firms in preparing procurement and R&D proposals through the small business development centers and NASA Industrial Applications Centers. These centers can use university, SCORE, or other talent to research and interpret the technical data and help support funding requests even if done on a temporary basis to deal with specific problem areas.

-Management and technical assistance as an "advisory-monitorship" function, should be encouraged in every procurement contract with small firms, and should be a requirement of Federal financial assistance contracts (either direct or guarantee loans).

-Financial assistance programs should have flexibility and include incentives to attract private capital such as is done in the NSF Small Business Innovation Research Program. Equity and/or personal guarantee requirements should be minimized.

-Small Business Investment Corporations (SBICs) should be permitted to make venture investments with the Small Business Administration (SBA) guaranteeing 80% of any loan portion of the financial package.

-State or regional development banks capitalized with both public and private funds should be encouraged wherever practical to provide additional debt and equity funding for start-up and growth of small, high technology firms. Such banks could reduce their risk by leveraging their investments with other private capital.

-Security and Exchange Commission (SEC) filing regulations should be simplified for small firms to encourage risk equity capital formation.

Tax Policies

Conclusion

Present tax policies discourage innovation by making it difficult to secure needed capital, attract management talent, and retain sufficient earnings to expand the business.

Recommendations

-The tax free "roll-over" provision should be restored similar to that available to home-owners if both the original investment and roll-over are made in small firms.

-The pension-fund (ERISA) policy should allow a certain amount of pension funds to be invested in high-risk innovative companies.

-The qualified stock option plan should be restored.

-The carry forward of loss should be restored to 10 years.

-A tax-exempt reserve for R&D should be allowed.

-The tax rate on the first five years of earnings for a small innovative firm should be reduced or possibly eliminated.

-Greater tax credits and deductions should be allowed for research and development expenditures.

-Increased rates of depreciation should be allowed for high technology plant and equipment investments.

Regulations

Conclusion

The number of regulations are increasing and now pervade every facet of a small firm's day-to-day operations. The time and cost expended in submitting reports is burdensome. Excessive regulations adversely affect the Nation's rate of innovation by discouraging new research efforts because needed research funds are diverted into regulatory compliance.

Recommendations

-Regulations should be reduced whenever possible.

-Regulations should be simplified and specify performance standards rather than specification standards.

-New regulations should be subject to a cost/benefit analysis.

Follow-up Action

Conclusion

Forceful and direct action should be taken by the President to implement the recommendations contained in this report.

Recommendations

The Director of the Office of Management and Budget (OMB) should be given the responsibility of implementing these recommendations concerning funding of Federal R&D and procurement; patent policy; technology transfer from Federal laboratories; management, technical and financial assistance; tax policies; and regulations. The Director is requested to report to the Committee on Science

and Technology what steps have been taken to implement these recommendations no later than December 15, 1980.

CONCLUDING REMARKS

All of the above recommendations will go a long way to strengthen the role of the small, high technology firm. These recommendations are succinctly stated and urgently needed because the small, high technology firm has the greatest potential leverage to create new products, new jobs, competition, markets and as a result, lower costs and prices. The benefits of such action to our Nation's economy and society will be self-evident.

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