Representative BRECKINRIDGE. Mr. Gellman, we now welcome you. We are delighted to have you with us today.

As I indicated, you may proceed at your own pace and in your own fashion with only one admonition—when you get tired of talking we will keep the record open so you can add to it at your convenience.

STATEMENT OF AARON GELLMAN, PRESIDENT, GELLMAN RESEARCH ASSOCIATES

Mr. GELLMAN. Thank you, Mr. Chairman.

My name is Aaron Gellman. I am president of Gellman Research Associates in Jenkintown, Pa. I am also vice president of a much larger consulting firm with which we are affiliated, Harbridge House, Inc.

I have a bachelor's degree in economics from the University of Virginia, an MBA from the University of Chicago, School of Business, and a Ph. D. in economics from MIT.

I have the honor to serve currently, as I have at other times in the past, on the commerce technical advisory board under Jordan Baruch.

I have also had a fair amount of experience and direct managerial involvement with enterprise, both small and large. Particularly with respect to small enterprise, I have been an investor in and director of a number of small firms in areas where the technology was often "high" and sometimes where it was low.

My orientation is academic in part; in that I am also an adjunct professor at the University of Pennsylvania, holding joint appointments in the department of regional science and in the management department of the Wharton School.

Mr. GELLMAN. Earlier today the chairman alluded to statements made on the record yesterday, and also to statements which can be found in literature to the effect that small business is an important part of the engine that drives the process of innovation. Indeed, small business, however, defined, has contributed vitally to the well-being of this country and to its growth and development. Unfortunately, there are precious few data through which we can test this hypothesis. I think that the hypothesis stands more on the perceptions of people who have been involved with the process of innovation, either as students of it, participants in it, or both. However, these perceptions are buttressed by the little hard evidence we do have.

For example, some time ago, Gellman Research was privileged, under sponsorship of the National Science Foundation, to take a look at a number of innovations—500 in total—in six countries. With the resources that we had at hand and the data that we gathered in the course of the project, we were able to determine that small firms certainly do play a critical role in generating innovation. This finding is illustrated by the data shown in table 3–8 of the volume that we produced for NSF, entitled Indicators of International Trends in Technological Innovation. For the period which we studied innovations in these various countries, found the following to be true in the United States alone: In 1963, of a total of 12 innovations that we incorporated in the study (the methodology is laid out in the study as to how these innovations were selected), seven were generated in firms having 1,000

the research and development phase to the technology delivery elements of innovation and thence to the market.

It seems to me very important to recognize that the public sector. Government has an important role to play in alleviating these problems—although I hope without interfering unduly with our free enterprise orientation, our free enterprise system, which I certainly think is the best system to produce, generate, and diffuse innovations.

In some cases the role Government should play would be in the nature of getting out of the way of the process of innovation when it is somehow impeding that process. In other cases, it involves the Government's lubricating the technology delivery process. Thus, the Government's role should sometimes be that of activist, and sometimes it should simply fade into the background as it were, at least in certain respects.

I think it important to recognize that certain activities of Government are more important (or conversely more onerous) for small enterprise than they are for large enterprise. Let me give you one very traditional sort of example—patents. Without in any way meaning criticism of the patent system, I think it can be said with some credibility that in the context of the process of innovation, which begins with R. & D. and goes on from there, patents play a relatively unimportant role for large enterprise. We have some evidence that large enterprise, for example, spends at least as much in the way of resources to delay the issuance of patents as it does to promote the issuance of patents.

This is a perfectly rational business decision in such cases.

But small enterprise finds that patents are often important when such firms are engaged in the total process of innovation. Patents are important to the small entrepreneur because, in many cases, those who would finance small entrepreneurial activities—particularly high-technology small entrepreneurial enterprise—want to see a piece of paper with a ribbon on it. It somehow appears to give them considerable security in their minds, if not in the conventional financial sense.

So it is that patents play a role for small business that is different, we think, fundamentally different from the role that patents play for large enterprise.

Representative BRECKINRIDGE. Could I interrupt you for a moment, Mr. Gellman?

We have a member on this committee. I do not want to misstate him in his absence. But he has had some experience with the problems of small business vis-a-vis big business. I think he is presently engaged in a patent suit trying to insure his right to produce that which is not patented, but which is allegedly patented by the large outfit that sued him.

From what I understand about it, he is on the right side of the case, but the courts will pass on that, of course.

Would you have some examples of that that might be useful for our record in connection with both the areas of assistance and non-assistance in connection with governmental participation in securing, if they do in any way, the rights of the small businessman against frivolous or malicious or unsubstantiated charges of abuse of patent rights or the denial of rights?

Mr. GELLMAN. Certainly.

Representative BRECKINRIDGE. Without objection, so ordered.[1]

Mr. GELLMAN. I earlier suggested that the process of innovation in very broad terms begins with ideation, invention, or conception, on the one hand, and then proceeds through a number of elements in what we call the process of innovation which leads ultimately to market introduction. I think it is of significance to point out that in the post-R. & D. parts of the process of innovation, the major elements of the technology delivery process, marketing and production, incorporate a number of developments. There is a flow chart model in the document I mentioned earlier that is generic to the process of industrial innovation. Some elements are grouped in the marketing phase and some in the production phase of the total process.

One of the most interesting things that you see in doing these studies and in working with entrepeneurs is that there are a number of elements in the process of innovation that are externalizable to the inovating organization with little damage to the innovative performance of the innovating organization—to the efficiency with which they proceed to the market with their technological possibility. Still, there are other elements in the process of innovation where to externalize them is a rather dangerous thing.

Let me give you an example. We have found that two of the very important elements in many innovative processes are those called prototyping and testing. When a product is under development, more often than not it reaches a point where there needs to be a prototype with which some testing can be conducted prior to other stages in the innovation process on the way to the marketplace. It occurs to us that a need for prototyping and testing has two very important implications for small enterprise. First, if we are right that in many innovation processes prototyping is something that can be externalized—that is, contracted out—then there may be some very interesting opportunities for specialized small enterprises to engage in prototyping and/or testing activities to serve and improve the efficiency of the population of small firms that are attempting to go all the way through the process of innovation from conception right to the marketplace.

A second observation of considerable potential importance to small enterprises is that if prototyping and testing are externalizable to the innovating organization with minimum impediment or threat to their carrying through the process of innovation successfully, these stages are in fact stumbling blocks in the process of innovation, particularly for small enterprise.

If this hypothesis is valid, as we suspect, then Government might be able to get a very substantial bang for its dollar in terms of economic growth and development by expliciting providing resources for prototyping and testing for small enterprises attempting to carry through the process of innovation from start to finish.

More studies are no doubt required into the prototyping and testing stages in the process of innovation.

We can look at each of the elements in the process of innovation and judge the effect on the enterprise with respect to the process in the cases where it tries to externalize one or more elements versus

[1] Material not available at time of going to press.

Consider agencies such as the Federal Aviation Administration. The FAA is the aggregate buyer of the largest proportion of the hardware and software which are used in air traffic control in this country. There are not many purchasers of air traffic control systems, hardware and software, in the United States. Indeed, the FAA's demands and technological technique choices are to a large degree exported to other countries that look up to us—properly, I think—as being the leader in this area.

The FAA has its own R. & D. activity, called E. & D., as well they ought). After all, they are buying a lot of the material, virtually all that is required in this field, and the agency should have an "engineering and development" organization. But I believe there is substantial evidence that the E. & D people in the FAA have never really understood what kind of contribution American genius, displayed through invention and entrepreneurial activity, can contribute to the production of a more cost-effective, and perhaps higher quality, air traffic control environment that we have today. Since these contributions are made disproportionately by small enterprises, it is especially to be regretted that such an agency appears not to appreciate the unique contribution small entrepreneurical units can make to an E. & D. program such as the FAA's.

It is very difficult for small enterprise to deal with the FAA where E. & D. is concerned. There are many people who can and will talk with you about this problem. I think the FAA is only an example in this regard, and I do not mean to single out this particular agency alone. I believe it important that the people who are involved with innovation in the United States—the Federal Government as well as government at State and local levels—must make explicit attempts to understand the potential of small enterprise in order to improve the process of innovation. Furthermore, we must make explicit attempts to promote an understanding of how to galvanize the American genius that is imbedded within the small rather than the large enterprise.

I also think it important that governmental organizations talk with each other about such problems and opportunities. This is true whether they are buying similar or different kinds of commodities. I suggest it might be wise to have created—although heaven knows we do not need any more bureaucracy—at least on a temporary basis, some mechanism by which those engaged at least in the R. & D. activities of various Federal agencies can meet—perhaps not more often than once every 6 months for a few years. One of the things they can talk about is the view of small business that each of them has to see if they can learn from each other's perceptions and policies.

Representative BRECKINRIDGE. May I interrupt at this point?

As you know, we had Dr. Baruch before us yesterday. He testified at length about the President's task force of 28 agencies and the work they have in their 18-month timetable. It was a very encouraging statement of the problem before us.

We discussed with him the desirability of proceeding on an ad hoc basis as an interagency group constituted for action purposes in addition to study purposes, bearing in mind that we have almost overstudied the problem to death, except how to get it done.

Mr. Gellman, please proceed.

Mr. GELLMAN. I cannot resist observing, being a native of Virginia, I was not sure whether you were describing Virginia or Kentucky there. You talked about bourbon and tobacco, and, of course, the beautiful ladies.

I suggested in response to your question, Mr. Breckinridge, that under the present situation I would think that the convening party of such a group—which group I think should not be established permanently, but rather for an interim or finite period because of the diminishing returns point which would soon be rendered by such a group—the convening party should be Dr. Baruch. I will tell you why: I believe devoutly that the people involved in R. & D. at the top, where policy is involved, and, indeed, where the responsibility for the management of the R. & D. lies—that the hallmark of these people should be that they understand the value of science and technology when that science and technology is successfully delivered to the marketplace. It is not of critical importance that they be either scientists or engineers. In fact, I would surely not look to only the science and engineering community for people useful in this context.

Indeed, I submit we have had enough instances where new people come into such positions who have backgrounds which are largely if not totally academic. (Please bear in mind that I am involved in the academic community myself—I'm not knocking academics.) They come into policy positions and positions where R. & D. is to be acquired and exploited and the tuition that the country pays to educate them to the real world is fearsome and terrible to behold. I believe devoutly that we need to make sure that the first thing such people should display is some appreciation for the value of science and technology to this economy—which value is only realized when there is market introduction and diffusion.

Having said that, I think Jordan Baruch is not only a scientist and engineer, which he is, but he also has great experience in industry, which is not unique but darn near it at the present time among these kinds of professionals in the Federal Government. I choose him not so much because he is in Commerce—although I think it is fortunate and that Commerce is a good place for him to be—but because I would very much like to see him be made the convenor of this kind of a session. Going a bit further, one or more of the meetings of such an interagency group should be devoted to small enterprise and how to work with it and what its contributions can and must be.

I mentioned earlier another matter that I believe Government should be explicitly careful about. I would like to stress it. In the procurement of R. & D. results. Government ought to think very carefully about the extent to which such results should be procured from enterprises that have no explicit interest in or intention of going beyond the R. & D. result into the marketplace. It is very important that we recognize clearly that the results of R. & D. will in most cases be expressed in very different ways if they will not be carried into the marketplace and subjected to the technology delivery process than if they will be. If an enterprise judges its R. & D. performance—and indeed judges its entire performance—on whether an R. & D. project, in and of itself, breaks even or makes a profit, it is attempting to please an external party with

there is still much that needs investigations. We know precious little, really, about the process of innovation as a process. We know a lot more, by the way, about R. & D. and R. & D. management than we do about the technology delivery that comes after. I would suggest this is out of kilter when you realize that in a typical industrial innovation—the Charpie report clearly evidences this and we have found it to be essentially correct—the R. & D. resources represent only on the order of 10 percent of the total resources required to go from the beginning to the end of the process of innovation. A successful R. & D. result, in a sense, is thus a license to spend nine times as much money before getting anything significant back.

I think we need to do some studies. We need to know a lot more about the technology delivery aspects of the process of innovation than we do. We need to look at it in a new way. For example—and this particularly goes to the heart of the problem in the R. & D. area—we need to know what the relationship is in our economy and how it is changing between national preeminence in various fields and national predominance.

What I mean is this. Take transport aircraft. The United States is clearly preeminent in the manufacture of large transport aircraft in many respects. We do very well in the world market for transport aircraft. As it turns out, we also have market predominance. By any standard, we dominate the market. In part, our predominance grows out of our preeminence, where preeminence is being the best and having the intellectual capital and the physical facilities to be the best.

However, it is also true that we have preeminence in a number of fields where we do not have predominance. I think we need to have a better understanding of the relationship between preeminence and predominance and where changes in this relationship are taking place. We ought to identify them and know why such changes occur. It is for predominance, as we said earlier, that technology delivery is needed. Market introduction is needed to create the jobs, expand the economy, as we want and need. If we are only preeminent, it is not good enough. Preeminence alone just does not get us the multiplier that comes only through market success—through predominance.

I will conclude here and be happy to stay as long as you like.

Representative BRECKINRIDGE. We want to thank you very much, Mr. Gellman. You have opened up a lot of parameters that we will not be able to get to today.

I wish I were in a position to say I would like to have you spend the next 3 months working with us in developing those parameters.

If you will, I would like you to say every and anything to this committee that you think ought to be said. We would like some of those figures that you have which would quantify some of the theoretical problems.

You talked about investing nine times as much as it takes to get there. This indicates the difficulty the small businessman has who cannot get the money to get the R. & D. done to get to the point where he needs nine times as much.

You can help me and this committee to that sort of a review of the studies and the data that are available and suggesting approaches and possibilities or probabilities. This will be most useful to us and will not just be filed away.

areas to the responsibilities, capacities, and the potential of small business and the contribution it has to make.

I would just like to say, in welcoming you and your associate, that the National Science Foundation has been so preeminent in this field which we have under consideration this morning that it has received an award of recognition of its contribution.

We are interested in your testimony and what you have done, and particularly what you intend to do and contemplate doing and how we can be of service and assistance to you to that end objective.

I will say to you what we say to all our witnesses: When we get through we will leave the record open for you to follow up with anything that you feel you could not cover to your complete satisfaction today.

We are delighted to have you.

STATEMENT OF DR. JACK T. SANDERSON, ASSISTANT DIRECTOR FOR APPLIED SCIENCE AND RESEARCH APPLICATIONS, NATIONAL SCIENCE FOUNDATION; ACCOMPANIED BY WILLIAM H. WETMORE, DIVISION DIRECTOR FOR INTERGOVERNMENTAL SCIENCE AND PUBLIC TECHNOLOGY, NATIONAL SCIENCE FOUNDATION

Dr. SANDERSON. Thank you, Mr. Breckinridge.

I would like to introduce Mr. Wetmore, who is with me this morning. He is the Division Director responsible for our industrial programs.

I am also accompanied by Mr. Wirths and Mr. Tibbits. Mr. Wirths is responsible for the Foundation's Office of Small Business R. & D.

Representative BRECKINRIDGE. We are delighted to have them. Would you like to have them join you at the table?

Dr. SANDERSON. I think they will have no hesitation in answering from the audience, so maybe we can proceed.

Representative BRECKINRIDGE. Thank you.

Dr. SANDERSON. I am very pleased to have the opportunity to appear at this joint hearing and describe some of the activities that interest you.

To save time I will summarize my statement. If I may, I would like to have my entire statement inserted in the record.

Representative BRECKINRIDGE. Without objection, your statement will be inserted in the record at this point.

[The prepared statement of Dr. Sanderson follows:]

PROGRAM RESULTS ACHIEVED TO DATE, 4) THE VIEW OF THESE PROGRAMS AS PERCEIVED BY THE SMALL BUSINESS COMMUNITY, AND 5) AN OUTLINE OF OUR FUTURE PLANS.

APPLIED SCIENCE AND RESEARCH APPLICATIONS DIRECTORATE

THE GOAL OF THE APPLIED SCIENCE AND RESEARCH APPLICATIONS (ASRA) DIRECTORATE IS TO INCREASE THE CONTRIBUTION OF SCIENCE AND TECHNOLOGY TO THE NATION BY IDENTIFYING AND SUPPORTING RESEARCH HAVING THE HIGHEST POTENTIAL FOR CONTRIBUTING TO THE UNDERSTANDING AND RESOLUTION OF SIGNIFICANT PROBLEMS.

THE ASRA PROGRAM IS ORGANIZED INTO FIVE SUBACTIVITIES: PROBLEM ANALYSIS, INTEGRATED BASIC RESEARCH, APPLIED RESEARCH, PROBLEM-FOCUSED RESEARCH APPLICATIONS, AND INTERGOVERNMENTAL SCIENCE AND PUBLIC TECHNOLOGY.

THE OBJECTIVE OF PROBLEM ANALYSIS (PA) IS TO IDENTIFY AND ANALYZE MAJOR NATIONAL PROBLEMS WITH SIGNIFICANT SCIENTIFIC AND TECHNOLOGICAL CONTENT AND TO PROVIDE A PRELIMINARY ASSESSMENT OF THE APPROPRIATE ROLE OF SCIENCE AND TECHNOLOGY, THE FEDERAL GOVERNMENT, AND NSF IN THEIR SOLUTION. THE OBJECTIVE OF INTEGRATED BASIC RESEARCH (IBR) IS TO ACCELERATE THE ADVANCEMENT OF PROMISING AREAS OF BASIC RESEARCH PARTICULARLY RELEVANT TO EXISTING OR EMERGING MAJOR PROBLEMS. THE OBJECTIVES OF APPLIED RESEARCH (AR) ARE TO PROVIDE A SOURCE OF SUPPORT

THE PROGRAM AREAS THAT I WOULD LIKE TO HIGHLIGHT TODAY DEAL WITH (1) THE SMALL BUSINESS RESEARCH AWAROS, INTENDED TO CAPTURE THE HIGHER INNOVATIVE CAPACITY OF SMALL BUSINESS; (2) THE INNOVATION CENTERS, DESIGNED TO DEVELOP INNOVATIVE AND ENTREPRENEURIAL SKILLS; (3) THE COOPERATIVE RESEARCH PROJECTS, STRUCTURED TO SHORTEN THE TIME LAG BETWEEN SCIENTIFIC DISCOVERY AND MARKET COMMERCIALIZATION; AND (4) THE UNIVERSITY-INDUSTRY RESEARCH CENTERS, DESIGNED TO PROVIDE A UNIVERSITY RESEARCH RESOURCE TO SEGMENTS OF INDUSTRY.

ALL FOUR OF THESE PROGRAMS ARE SPECIFIC AND REPRESENTATIVE OF OUR DIRECT INVOLVEMENT WITH THE SMALL BUSINESS COMMUNITY. LET ME TREAT EACH OF THE PROGRAMS IN SOME DETAIL.

SMALL BUSINESS SOLICITATION

THE ASRA DIRECTORATE HAS A TARGET LEVEL OF FUNDING FOR SMALL BUSINESS, CURRENTLY 12 1/2% OF ALL AWAROS. THIS TARGET WAS ORIGINALLY SET FOR 7 1/2% AND HAS BEEN INCREASED BY 2 1/2% PER YEAR. SUCH A TARGET HAS BEEN WITHIN OUR CAPABILITY AND HAS BEEN ACHIEVED WITHOUT ANY RELAXATION OF THE STANDARDS OF SCIENTIFIC EXCELLENCE THAT IS ASSOCIATED WITH NSF AWARDS.

THE REQUIREMENT THAT THE VENTURE CAPITAL COMMITMENT BE OBTAINED IN ADVANCE OF THE PRINCIPAL FEDERAL RESEARCH SUPPORT FORCES PROPOSERS TO THINK IN ADVANCE ABOUT ANY COMMERCIAL POTENTIAL OF THE FEDERAL RESEARCH AND POSSIBLY TO MODIFY THEIR APPROACH TO ACHIEVE BOTH FEDERAL AND COMMERCIAL OBJECTIVES. IT FORCES CONSIDERATION OF POSSIBLE TECHNOLOGY TRANSFER OF FEDERAL RESEARCH TO THE CIVIL SECTOR IN THE PROPOSAL PLANNING STAGES. IT ALSO IS A MUCH STRONGER STATEMENT OF POTENTIAL UTILIZATION OF THE RESEARCH THAN STATEMENTS WITHOUT SUCH FINANCIAL COMMITMENTS. THE COMMITMENT FOR FOLLOW-ON VENTURE CAPITAL IS TREATED AS AN EXTRA POINT-OF-MERIT IN THE PROPOSAL EVALUATION PROCESS WHEN OTHER FACTORS ARE OF APPROXIMATELY EQUAL MERIT.

THIS APPROACH PROVIDES SMALL FIRMS WITH SOMETHING SPECIFIC TO HELP THEM ATTRACT FOLLOW-ON VENTURE CAPITAL. THE FIRM CAN SHOW THAT THEY HAD THE TECHNICAL COMPETENCE TO RECEIVE AN NSF AWARD, THAT GOVERNMENT FUNDING WOULD MINIMIZE THE RESEARCH RISK, AND THAT THEY HAD TO WIN A PHASE II AWARD AND ACHIEVE CERTAIN MUTUALLY AGREED UPON OBJECTIVES BEFORE THE VENTURE CAPITAL COMMITMENT APPLIED FOR THE DEVELOPMENT PHASE. THIS IS A SUBSTANTIAL INCENTIVE FOR VENTURE CAPITAL FIRMS OR LARGE MANUFACTURERS WHO MAY BE APPROACHED BY THE SMALL BUSINESS.

THE NATIONAL SMALL BUSINESS ASSOCIATION PASSED A SEPARATE RESOLUTION AND DR. SAM CARDON, PRESIDENT OF THE AMERICAL ASSOCIATION OF SMALL RESEARCH COMPANIES STATED THAT THE PROGRAM WAS BOLD, IMAGINATIVE AND THROUGH THE INCENTIVES PROVIDED OFFERED "A FRESH NEW APPROACH TO STIMULATING TECHNOLOGICAL INNOVATION IN OUR ECONOMY."

I HAVE INCLUDED OTHER STATEMENTS MADE ABOUT THE PROGRAM AS AN ATTACHMENT TO MY TESTIMONY.

THE VAST MAJORITY OF SMALL BUSINESS AWARDS, HOWEVER, HAVE NOT COME FROM A SPECIAL SOLICITATION SUCH AS I JUST OESCRIBED. APPROXIMATELY 300 AWARDS TOTALING OVER 20 MILLION DOLLARS HAVE RESULTED FROM UNSOLICITED PROPOSALS FROM SMALL BUSINESS WHICH MATCHED THE PROGRAM ELEMENTS OF ASRA, SUCH AS EARTHQUAKE TECHNOLOGY, CHEMICAL THREATS TO THE ENVIRONMENT, TECHNOLOGY FOR THE HANDICAPPED ANO PRODUCTION TECHNOLOGY. ALL PROGRAM MANAGERS OF ASRA WILL CONTINUE TO ENCOURAGE SUCH PROPOSALS FROM SMALL BUSINESS. IN FACT, THEY MUST CONTINUE TO DO SO IN ORDER TO MEET OUR GOAL, SINCE THE SOLICITATION ALONE IS NOT SUFFICIENT AT THE PRESENT "SET ASIDE" LEVEL OF 12 1/2%.

NSF ALSO HAS TAKEN OTHER STEPS TO ENCOURAGE SMALL BUSINESS PARTICIPATION IN GOVERNMENT R & D. WE HAVE SPONSORED THREE SMALL BUSINESS CONFERENCES ON ASRA AND FEDERAL R & D TO OATE. IN JANUARY 1976, THE FIRST CONFERENCE WAS HELD HERE IN WASHINGTON, D.C.; IN MAY 1977, IN BURLINGAME, CALIFORNIA; AND THIS YEAR IN CHICAGO ON MAY 22-23. THE WASHINGTON AND CHICAGO CONFERENCES INCLUOEO THE PARTICIPATION OF ALMOST EVERY FEDERAL AGENCY WITH SUBSTANTIAL R & O PROGRAMS.

THE INNOVATION CENTER EXPERIMENT. THESE CENTERS OFFER A DRAMATIC DEMONSTRATION THAT SCIENTIFIC RESEARCH AND DEVELOPMENT AT UNIVERSITY CENTERS CONTRIBUTES TO THE GROWTH OF THE ECONOMY WHEN THE ENTREPRENEURIAL TALENT IS DEVELOPED.

IT IS ESTIMATED THAT ADDITIONAL CENTERS COULD BE ESTABLISHED OVER THE NEXT FIVE YEARS AND GEOGRAPHICALLY DISTRIBUTED TO SERVE THE ENTIRE NATION. SUCH A PROGRAM COULD CONCEIVABLY ACCOUNT FOR THE DEVELOPMENT OF 200-300 NEW TECHNOLOGY-ORIENTED BUSINESSES PER YEAR WITH GROSS SALES APPROACHING $300,000,000 AND PROVIDE TECHNICAL ASSISTANCE TO SEVERAL THOUSAND EXISTING BUSINESSES. THE RETURN TO THE FEDERAL TREASURY IN TAXES ON CORPORATE PROFITS AND EMPLOYEE PAYROLLS IS ALREADY NEARLY TEN TIMES AS LARGE AS THE AVERAGE ANNUAL INVESTMENT BY NSF.

THE NSF SUPPORT OF THE THREE ORIGINAL CENTERS IS SCHEDULED TO END THIS YEAR. ONLY ONE OF THESE HAS DEMONSTRATED AN ABILITY TO CONTINUE WITHOUT FURTHER SUPPORT. RENEWED BUDGET SUPPORT AND EXPANSION OF THIS PROGRAM SHOULD MATCH THE GOALS OF THIS COMMITTEE. THE NSF HAS BEEN PLEASED TO SHARE THE KNOWLEDGE DEVELOPED IN THIS AREA OF INNOVATION CENTERS. WE WILL CONTINUE TO WORK WITH ALL ORGANIZATIONS TO ASSIST IN DISSEMINATING THE RESULTS OF THIS RESEARCH.

IF THIS TURNS OUT TO BE THE CASE, AND SOME OF THE RESEARCH WE ARE SUPPORTING EXAMINES THE ISSUES, REGULATIONS MAY PLACE SMALL BUSINESSES IN VARIOUS INDUSTRIES AT A COMPETITIVE DISADVANTAGE WITH LARGER FIRMS.

FUTURE

FOR THE IMMEDIATE FUTURE, WE ARE PLANNING ON HAVING, ANNUALLY, ONE SMALL BUSINESS SOLICITATION AND TWO SMALL BUSINESS CONFERENCES. WE ALSO PLAN ADDITIONAL INNDVATIDN CENTERS AND INDUSTRY/UNIVERSITY COOPERATIVE RESEARCH CENTERS CONTINGENT UPON BUDGET APPROPRIATIONS.

WE HAVE FOUND THESE TO BE EFFECTIVE INSTRUMENTS FOR INITIATING NEW SMALL BUSINESSES AS WELL AS ASSISTING CURRENT SMALL BUSINESSES. THESE PROGRAMS HAVE BEEN WELL RECEIVED BY UNIVERSITIES AND INDUSTRY, BOTH LARGE AND SMALL.

CONCLUSION

THE NATIONAL SCIENCE BOARD, THE NATIONAL SCIENCE FOUNDATION AND ASRA ARE CONVINCED THAT SMALL BUSINESS IS A MAJOR CONTRIBUTOR TO TECHNOLOGICAL INNOVATION AND ECDNOMIC GROWTH. WE BELIEVE IT TO BE IN THE NATIDNAL INTEREST THAT PROGRAMS SUCH AS I HAVE DESCRIBED TODAY RECEIVE CAREFUL STUDY AND INCREASED SUPPORT. WE ARE UNABLE TO SAY WHICH OF THE EXPERIMENTAL INCENTIVES WHICH HAVE BEEN PRESENTED TODAY CAN BE GENERALIZABLE AND WILL WORK IN ANY OTHER FEDERAL AGENCIES. WE DO KNOW THAT THESE METHODS APPEAR TO BE WORKING FOR US, PRIMARILY BECAUSE OF OUR BROAD CHARTER.

ATTACHMENT

ADDITIONAL STATEMENTS ON THE SMALL BUSINESS INNOVATION PROGRAM

- Mr. Robert Averitt, Professor Economics at the University of Texas at Dallas, wrote that "The new NSF program provides an ingenious method for screening the work of small, high technology firms and thus reducing the risk for a potential supplier of venture capital funds." He also said, "I cannot suggest a single improvement in the proposed program."

- Dr. Gilbert Levin, President of Biophysics and one of the Phase I awardees also wrote stating, "The whole program is marvelously refreshing . . . I thoroughly enjoyed receiving the NSF solicitation asking for original ideas. I can also assure you that we expended an uncommon level of effort and gave this six-month, $25,000 project everything we could."

- A letter from an unsuccessful proposer stated, "We were very impressed with the design of the program solicitation. It is one of the few that addresses itself to a critically important gap that we have found exists in many areas of technology . . . small businesses are interested in smaller, often more specialized, and higher technology markets which often do not interest large business because of this initial market size, but small firms cannot afford the entry fee which in our experience is in the range of $100,000 to $500,000."

- Dr. Arthur Obermayer, President of Moleculon Research Corporation, which won two Phase I awards, and also Vice President of the American Association of Small Research Companies, wrote an article published in Chemtech this past May which stated, "The most exciting new program to emerge from the government in years is the small business innovation program of the National Science Foundation."

try experimental incentives which can stimulate R. & D. in the private sector where new technology is needed in the national interest.

In the applied research area, NSF has been making awards to small businesses since 1971. By the end of this fiscal year the Applied Research Directorate will have made 368 such awards totaling something over $30 million.

These awards have been in all areas of national importance—energy, environment, productivity, and health. The program areas I would like to highlight today deal with the small business research awards.

These are intended to capture the highly innovative capacity of small business. They include the innovation centers, designed to develop entrepreneurial and innovative skills; the cooperative research projects, structured to shorten the time lag between discovery and commercialization; and the university industry research centers, designed to provide a university resource that, when coupled with segments of industry and research knowledge developed in the universities would attract industrial users.

All of these programs are specific in their design and represent direct involvement with the small business community. I might add that the small business solicitation is one of the components which the chairman mentioned earlier.

We have a target level for fiscal year 1978 of 12.8 percent of the ASRA funds to go to small business. This target level was originally set at 7.5 percent several years ago and has increased steadily at a rate of 2.5 percent per year since that time.

We have been able to achieve such a target with reasonable ease. We have achieved it without any relaxation of the standards of scientific excellence which we associate with all NSF awards.

Last year the National Science Foundation initiated a new program entitled "Small Business Innovation Applied to National Needs." This program has been particularly well received by the small business and venture capital communities.

Although its primary objective is to fund quality research proposals on the program objectives of the Applied Research Directorate, it has two other principal goals. One is to stimulate technological innovation in the private sector. The second is to design a program to meet the needs of small science and techology for these firms, as well as to meet the needs of the Federal Government.

The program was structured in two phases. Phase I provided research awards of approximately $25,000 each to determine the feasibility of innovative ideas prior to a larger Federal investment. Phase II, which is open only to people who compete successfully in phase I, provides a higher level of funding to those projects which show the most promise after completion of the initial feasibility studies.

The small business innovation program has a number of unique characteristics. First, it emphasizes research on program objectives that primarily have potential for technological innovation to a small firm, something the small firm can later take to the commercial market by using the Federal research as the base for further applied research and development.

Second, it encourages the small firm to obtain a commitment for follow-on private venture capital from a third party in order to pursue the possible commercial applications of the federally funded research

All program managers of ASRA will continue to encourage such proposals from small business. In fact, they must continue to do so, since to maintain the quality standards we set and to meet our goal of 12.5 percent this year, the solicitation alone is not adequate.

NSF has also taken other steps to encourage small business participation in R. & D. To date, we have sponsored three small business conferences on ASRA and on the Federal R. & D. effort. In January 1976, the first conference we held here in Washington, D.C. In May 1977, it was in Burlingame, Calif. This year it was in Chicago on May 22–23, 1978.

The Washington and Chicago conferences included not only NSF participation, but participation of almost every Federal agency which has a substantial R. & D. program. The conferences have proved to be effective instruments for providing an opportunity for small business understanding and participation in Federal programs.

I will say that I have been very impressed at the conferences I have attended. It is amazing, the number of small businesses with creative and innovative ideas seeking opportunities to match their capabilities to the research needs in the Federal Government and the private sector.

A new program is being designed at ASRA that will affect the level of small business awards. This is the appropriate technology program. The design of that program was begun this summer and early fall with seven regional forums. A full report on these forums is scheduled for release in December 1978.

By the very nature of appropriate technology, we expect that small business will be a strategic player in this research effort.

A second type of activity is the innovation centers. NSF research interest in these innovation centers is an experiment to study alternate ways to mobilize university staffs and facilities as resources to newly created firms. It is also a way to train science and engineering students in the skills that they will need to innovate successfully in the civilian market.

There are four active centers in this project at the present time: Carnegie Mellon, MTT, University of Oregon, and the University of Utah.

Over the period of this experiment there has been widespread interest in this program, both within the United States and abroad. Some two dozen new businesses have been started as a direct result of activities at these centers. In these businesses, sales are currently in excess of $15 million a year. They are growing at about 50 percent per year.

The importance of this program is the demonstration that new small businesses and new jobs can be created through appropriate university training and development of entrepreneurial ability. More than 1,000 new jobs have been created through these centers.

According to a current study at the Brookings Institute, the cost in Federal funds to create a single additional job averages about $25,000. This figure is more than eight times the $3,000 cost for jobs created through the innovation center experiment. These centers offer a dramatic demonstration that scientific research and development, coupling university centers with small business, can contribute to the growth of the economy when the entrepreneurial talent is developed.

conferences each year. We also are planning future additional innovation centers and industry-university cooperative research centers contingent upon the availability of funds.

We have found that all these are effective instruments for initiating new small businesses and for assisting existing small businesses to benefit basic research capabilities in the country. They have been well received by universities and by industry, both large and small.

In conclusion, I would like to say that the National Science Board, the Foundation, and ASRA, are convinced that small business is a major contributor to technological innovation and growth. We believe it to be in the national interest that programs such as I have described today receive careful study and increased support.

We are unable to say which of these incentives described today will work in other agencies. We do know they appear to be working for us, primarily because of our broad charter to support the best in science.

We are optimistic about the role of small business and technological development in the science base of the Nation. We have discovered a valuable alliance between NSF and small business. It is our intention in the future to build upon this reliance for the common good.

I thank you for the opportunity to appear. I will be pleased to answer any questions.

Representative. BRECKINRIDGE. I want to thank you, Dr. Sanderson, for your statement and your contribution to the committee's record. I particularly want to commend the Foundation for its initiative.

I think from what has come to the committee's attention so far that you are in the vanguard of a long neglected procedure.

Dr. SANDERSON. That credit should be shared with many people. The Congress itself has been active in encouraging NSF to be more involved with small business. The initiative to go into small business in a substantial way was a congressional initiative. It is one which we have benefited from.

Representative BRECKINRIDGE. What we want to do is to contribute and to participate a little more. I thank you for that invitation which we take as such.

Let me, if I may, for the record, direct a few questions to you. Then I will ask you to enlarge somewhat on your thinking.

You are familiar, of course, with the so-called OMB Rabinow Report which has yet to be published. That is not true. This committee, along with the Senate committee, in yesterday's meeting published that report which, for years now, has not, for some reason we will find out later on in these hearings, been made public.

Do you agree with its findings? If you do, would you tell me what specifically the NSF is doing to implement its recommendations?

Dr. SANDERSON. A number of key findings in the Rabinow Report reflect at least my thinking and the thinking of much of the Foundation. The major activities which we have undertaken have been included in some of the programs I have described here.

The National Science Foundation procures relatively little. Of the total appropriation to NSF, about 95 percent is provided to nongovernmental organizations or individuals, universities, small or large business, or nonprofit groups, to support research activities in those institutions.

program like ours. I think we are in a position now to do some creative things.

Like any organization, we have benefited from growing at a controlled rate. I think a controlled rate of growth will allow us to expand without sacrificing the quality of the product that we are producing. While we also talk about the potentials for growth and how much more we could do, I think it has to be done with reason and with moderation. There are many more small business firms that now know us and whom we now know. Five years ago we would have had no way of finding them. But word-of-mouth is spreading, and we are beginning to establish good relationships with the small business research community.

I think there is a potential for a steady rate of growth, probably not at the rate that you might like to see, Mr. Chairman, or that I would like to see, but I think there has to be a tempering of our desire to reach the end of the road with the recognition that we have to take one step at a time.

Representative BRECKINRIDGE. Your data supports your conclusion. I will not argue with you, but I am going to put it in another context, if I may.

Your multipliers of one-half of the cost and more than one-half of the innovative development and 2.6 times the productivity as between vis-a-vis small and large, and the job creation implications and other studies that have been brought to our attention, indicate different figures than other witnesses.

For example, one of the witnesses on the Senate side yesterday, Dr. Morse from the MIT, did a study of 16 high technology innovative industries and showed an annual 40 percent job creation growth rate versus a six-tenths of 1 percent, which is my figure—I do not know that he used that—for the Fortune 1,000.

Putting that kind of a picture together piece by piece from the various witnesses who are coming before us, and putting together the priorities that address the Congress and the administration in terms of the twin evils of inflation on the one hand and unemployment on the other—which we have primarily been beating by some significant investments of public funds and public service job creation with debatable returns—you get down to the question of the ordering of national priorities in terms of investment and staffing.

I can staff at some $25 billion through CETA and other programs, a deficit job market and job force which will be back here next year asking for $35 billion for that purpose.

Or, I can multiply the kind of investment you are talking about in your area and the kind of loan insured and/or guaranteed programs that we are familiar with in the Farmers Home Loan and the Small Business Administration. I would say I could generate 10 jobs for 1, just to pick a round figure per dollar, which will pay its way out per annum within the private sector originating with small business, if we can get the attention of the proper authorities.

So, when I start talking about dollar investments and costs and ask you to state what could be done, do you not take on the functions of the Office of Management and Budget and tell me what cannot be done because of the fiscal constraints of the society in which you exist because it is those constraints which bring us here today.

create in our economy. What we are looking for is a way or ways that the Federal Government can help small business play that creative role.

Representative BRECKINRIDGE. I would agree. But I would say it another way.

That competence and capacity has been there for a couple hundred years. What you are doing is watering that and you are fertilizing it and funding it. You are thereby making it possible. Absent that, it would not now be going on.

So, within this context, my question is: How do we maximize our national potential within the $500 billion budget that we have and realizing our national objective?

We do not want to fall into arrears with Soviet technological development, which we are doing now. I am talking about the war systems.

We do not want to fall into arrears with the major industries of our friendly nations and allies which are investing significantly larger amounts in innovative development and research, both applied and basic. They are taking our jobs overseas. I do not object to their taking our jobs overseas on a truly competitive basis, but when we refuse to compete we are not truly competitive.

Again, addressing this to the national rather than the interagency structure, are we not just as guilty of total and complete oversight and neglect of our greatest asset, which is our people and their ability to generate? This falls within the area of small business, too; right?

Dr. SANDERSON. Certainly we have not responded to the existing needs and opportunities as fully as we should. If you look at the history of this country, for all except the past 10 or 15 or maybe 5 years, this country has been primarily domestically oriented. We have relied upon internal sources of most of our raw materials. We have relied upon domestic sources for our entrepreneurial development. We have relied upon domestic markets for our products.

Indications today are that this is changing. We are becoming much more an international trading agency and are being forced to compete on the same basis in the international markets. We no longer can rely upon domestic sources for many materials. Energy is the most widely discussed one; there are others.

The domestic market is no longer adequate for many of our products. We are being forced more and more to sell overseas in order to pay for items which we are buying overseas and bringing here. This represents, at least in my view, a major reorientation of our philosophy of the way we relate to business, and of the way we relate to R. & D. technological innovation.

Hearings such as you are conducting here certainly represent an effort to reevaluate these relationships and to find new ways to put the United States back, not only in the preeminent position, but also in the position of a preponderant force in the world market.

I wish I thought our programs were the answer or a big part of the answer. I think they are a small part of the answer. I think they have proven for NSF a very successful way to go. I do see opportunities to build on them. And I do see some opportunities for ideas like ours to be innovated in other agencies with different missions, but I do not think we have found the answers yet.

Dr. SANDERSON. Yes.

Representative BRECKINRIDGE. The next question goes to basic research. Put the two together.

Dr. SANDERSON. The Foundation has had a policy which it began to reexamine several years ago. It was restated in a revised policy of the National Science Board within the past year. The policy recognizes the ability of small industry and the basic research industry to compete with unique resources and unique capabilities and unique ideas.

But at the same time it recognizes the decision—which is almost a conscious decision in this country—to couple the training of young scientists and engineers and the creators and innovators of tomorrow into the basic research end of the spectrum.

Therefore, it is important to be sure that a substantial support element goes to the Nation's universities and colleges. The policy adopted in that area is to allow the industries to compete where they can bring a unique capability to the research being proposed. At the same time, we recognize the double benefit from training these scientists in the university environment at the time the research is being done.

Representative BRECKINRIDGE. Let me thank you for your testimony. Let me repeat my invitation to you to go back and come up with an enlarged plan without the fiscal constraints that we all have to plan in terms of, so we can renegotiate relationships, perhaps in the future.

Dr. SANDERSON. Yes, we will provide you with that material.

Representative BRECKINRIDGE. One of the former witnesses added two words to my studies—"idealization" and "externalization."

You have given me one. I knew I would get it somewhere today—"generalizable." I know what you are doing, and I am proud of you for doing it. I want you to keep it up, but what about this?

Dr. SANDERSON. Maybe I should apologize to the King's English for that word.

Representative BRECKINRIDGE. Yes.

Dr. SANDERSON. What we are trying to do is to find things within the research and the experimental character of NSF that can be adopted by other agencies and by the private sector. Some of these things are showing signs of being adopted. For example, Canada has expressed a great deal of interest in our innovation centers experiment and is adopting a program modeled after it.

Representative BRECKINRIDGE. I am afraid the whole world will and we will not.

Let me ask Mr. Spira if he has any questions. Then Mr. Glover will ask any questions he has.

Mr. SPIRA. I have two questions.

Could you supply for the record the appropriate budget figures, the history of it, and the future requests for the appropriate programs?

Dr. SANDERSON. Do you mean for the program involving small business?

Mr. SPIRA. Yes.

Dr. SANDERSON. Yes, I would be glad to supply that for the record. I can give you the history at this point.

It ranged in 1971—the first year in which the Foundation supplied research in small business activities—from four awards totaling almost $500,000 to 1977 in which we made 95 awards totaling something over $7.5 million.

EXCERPTS FROM NSF AUTHORIZATION LEGISLATION RE SMALL BUSINESS

(The initiatives have originated in the Senate)

FY 1976---Senate Authorization Subcommittee Report (94-111) on its Bill (S-1539)
NSF Authorization Act, 1976 (PL 94-86) & Conference Report (S. 94-339)

FY 1977---Senate Authorization Subcommittee Report (94-888) on its Bill (S.3202)
NSF Authorization Act, 1977 (PL 94-471) & Conference Report (H 94-1689)

FY 1978---Senate Authorization Subcommittee Report (95-93) on its Bill (S. 855)
NSF Authorization Act, 1978 (PL 95-99) & Conference Report (H. 95-504)

FY 1979---Senate Authorization Subcommittee Report (95-851) on its Bill (S. 2549)
NSF Authorization Act, 1979 (PL 95-434) (no Conference Report).

Calendar No. 106

94TH CONGRESS
1st Session

SENATE

REPORT
No. 94-111

NATIONAL SCIENCE FOUNDATION AUTHORIZATION ACT, 1976

MAY 9 (legislative day, APRIL 21), 1975.—Ordered to be printed
Filed under authority of the order of the Senate of May 8 (legislative day, April 21), 1975

Mr. KENNEDY, from the Committee on Labor and Public Welfare, submitted the following

REPORT

[To accompany S. 1539]

The Committee on Labor and Public Welfare, to which was referred the bill (S. 1539) to authorize appropriations for activities of the National Science Foundation, and for other purposes, having considered the same, reports favorably thereon with amendments and recommends that the bill as amended do pass.

I. SUMMARY

The purpose of S. 1539, as amended by the Committee, is to authorize appropriations to the National Science Foundation for fiscal year 1976 in the amount fo $822,600,000, and in foreign currencies which the Treasury Department determines to be excess to the normal requirements of the United States, $4,000,000 for fiscal year 1976.

II. BACKGROUND

The National Science Foundation is the only Federal agency with a direct mandate to strengthen science and science education. It performs a critically important and unique function. We are looking to scientists for guidance in finding solutions to air and water pollution control problems; for improved designs for mass transportation systems; for more effective utilization and delivery of health services; and for methods of allocating scarce resources as fairly and effectively as possible.

38-010—75——1

In an earlier report, in 1973, the National Board on Graduate Education also expressed concern about the long term effects of the erosion of support for basic science:

> The real and present danger is that the urgency of current problems will lead to an underestimate of the seriousness of problems to be encountered one to five decades in the future, and to an incorrect assessment of the value of basic research and of the level at which it should be supported. The absence of growth (in real terms) of federal expenditures for basic research in colleges and universities since 1968 is an ominous development.

The Committee approved $389 million for Scientific Research Project Support, an increase of $9 million over the Administration's budget request.

National and special research programs

The budget request submitted by the Administration included $107 million for National and Special Research Programs.

The Committee has repeatedly called attention to the importance of updating the academic research fleet. Three ships previously authorized by the Committee in the 150–159 foot class will enter service during fiscal year 1976. The Committee is pleased that this will bring the average age of this portion of the academic research fleet down from 20 years to 12 years. The average age of ships in the coastal category, however, is now 17.5 years and is expected to reach 19.5 years in 1977. This of special concern to the Committee because of the increased need for research in coastal waters and on the Continental Shelf. An up-to-date research fleet is required for this effort, and the Committee has added $4 million to the Administration's budget request to be used for the construction of research ships in this category.

The other programs authorized by the Committee include major research efforts which relate to specific geographic areas or which are of such magnitude that extensive coordination of planning, funding, evaluation and logistic support are essential to ensure maximum effectiveness and efficiency in program performance.

The Committee has approved a total of $113.5 million for National and Special Research Programs, an increase of $6.5 million over the Administration's budget request.

Science information activities

The budget request su mitted by the Administration included $5 million for Science Information Activities.

The Committee has been concerned over the continuing problems caused by cutbacks in funding for the Office of Science Information Service in the National Science Foundation. Severe dislocations have been caused in the orderly development of information handling systems. Many of the most difficult problems facing the United States today—particularly those broadly described as energy and environment as well as those related to health—depend for their solutions upon effective use of scientific and technical information. Such informational capabilities do not presently exist although other national governments (notably the West German, Japanese and Soviet governments) are making much larger national commitments to the development of information-transfer systems. Scientific and technological

JOINT EXPLANATORY STATEMENT OF THE COMMITTEE OF CONFERENCE

The managers on the part of the House and the Senate at the conference on the disagreeing votes of the two Houses on the amendment of the Senate to the bill (H.R. 4723) National Science Foundation Authorization Act, 1976, and for other purposes, submit the following joint statement to the House and the Senate in explanation of the effect of the action agreed upon by the managers and recommended in the accompanying conference report:

The amendment of the Senate struck out all after the enacting clause in the House bill and substituted new language. The committee of conference agreed to accept the Senate amendment with certain amendments and stipulations proposed by the conferees.

The National Science Foundation requested authorization in the amount of $751,400,000 for fiscal year 1976, plus $4,000,000 in excess foreign currencies. The House authorized the amounts requested. The respective Senate figures were $822,600,000 and $4,000,000 in excess foreign currencies.

The committee of conference recommends $787,000,000, plus $4,000,000 in excess foreign currencies. This figure is $35,600,000 more than authorized by the House and $35,600,000 less than authorized by the Senate for fiscal year 1976.

The specific actions taken by the conference are as follows:

SECTION 1—FUNDS

1. For Scientific Research Project Support, the budget request of the National Science Foundation was $380,000,000. The House authorized $366,300,000 and the Senate authorized $389,000,000. The conferees agreed on $377,600,000.

2. For National and Special Research Program the Foundation requested $115,500,000. The House authorized $101,500,000 and the Senate authorized $113,500,000. The conferees agreed on $109,800,000, which includes $2,300,000 for the construction of coastal research vessels.

3. For National Research Centers, tha House, the Senate and the conferees approved the Foundation request for $60,200,000.

4. For Research Applied to National Needs the Foundation requested $79,500,000. The House authorized $60,000,000 and the Senate authorized $81,000,000. The conferees agreed on $70,500,000.

5. & 6. For Science Education Improvement the Foundation requested $50,000,000. The House authorized $39,300,000 for Science Education Innovation and $34,700,000 for Science Education Support; the Senate authorized $70,000,000 for Science Education Improvement and $15,000,000 for Institutional Support. The conferees agreed on $39,800,000 for Science Education Innovation and $35,300,000 for

(4) Science Information Activities, $7,000,000.

(5) Research Applied to National Needs, $25,000,000 for environmental research, including $5,500,000 for earthquake engineering.

(6) Ethical and Human Value Implications of Science and Technology, $1,500,000.

(7) Research Applied to National Needs—not less than 10% of such funds shall be expended to small business concerns.

The Conferees agreed to the following minimum obligations levels:

(1) Science Education Innovation, $39,800,000 floor.

(2) Science Education Support—$35,300,000 floor with subfloors including $3,000,000 floor for Undergraduate Research Participation, $2,500,000 floor for Secondary School Student Science Projects, $2,000,000 Science Faculty Fellowships, $15,000,000 floor for CAUSE (including $3,500,000 floor for two-year institutions), $5,000,000 for RIAS and $7,000,000 floor for Ethnic Minorities and Women in Science (including $1,500,000 to develop and test methods of increasing the flow of women into science careers). The Conferees expect that the increase in the Ethnic Minorities and Women in Science program, together with carryover funds from fiscal year 1975, will enable the Foundation to increase funding of programs for ethnic minorities and to conduct more effective programs to encourage women to enter careers in science and technology.

(3) Graduate Student Support, $16,400,000 floor.

(4) Science Information Activities, $6,600,000 floor.

(5) Research Applied to National Needs—$25,000,000 floor for environmental research including $5,500,000 floor for earthquake engineering; $23,000,000 floor for Applied Social Research and for Policy Sciences Research, with the proviso that such research should not substantially duplicate other federally funded research; and not less than 7.5% of available funds to be expended to small business concerns. The Conferees also agreed that the Foundation should make an effort to expend up to 10% to small business concerns and indicated that for fiscal year 1977 a set-aside at that level should be considered; and $1,000,000 floor for fire research with a proviso authorizing the transfer of the NSF/RANN Fire Research program to the Fire Research Center of the National Bureau of Standards. The Fire Research Center was established under the Federal Fire Prevention and Control Act of 1974 as a focus for fire related research separate from the National Fire Prevention and Control Administration, and the conferees agreed that the NSF/RANN fire research program should be transferred to this Center.

(6) Intergovernmental Science Program, $8,000,000 floor.

(7) Ethical and Human Value Implications of Science and Technology, $1,500,000.

Section 2(b) Instructional Materials

The House bill included a section providing that instructional science curriculum materials developed under grants from the NSF must be made available for inspection in local school districts to the parents of children using such materials. The Senate bill included no comparable provision.

Public Law 94-86
94th Congress, H. R. 4723
August 9, 1975

An Act

Authorizing appropriations to the National Science Foundation for fiscal year 1976.

National Science Foundation Authorization Act, 1976.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there is hereby authorized to be appropriated to the National Science Foundation for the fiscal year ending June 30, 1976, for the following categories:

(1) Scientific Research Project Support, $377,600,000.
(2) National and Special Research Programs, $109,800,000.
(3) National Research Centers, $60,200,000.
(4) Research Applied to National Needs, $70,500,000.
(5) Science Education Innovation, $39,800,000.
(6) Science Education Support, $35,300,000.
(7) Graduate Student Support, $16,400,000.
(8) Science Information Activities, $6,600,000.
(9) International Cooperative Scientific Activities, $8,000,000.
(10) Intergovernmental Science and R. & D. Incentives Program, $10,000,000.
(11) Science Assessment, Policy, and Advisory Activities, $11,100,000.
(12) Program Development and Management, $41,700,000.

SEC. 2. (a) Notwithstanding any other provision of this or any other Act—

(1) of the total amount authorized under section 1, not less than $39,800,000 shall be available for the purpose of "Science Education Innovation";

(2) of the total amount authorized under section 1, not less than $35,300,000 shall be available for the purpose of "Science Education Support";

(3) of the total amount authorized under section 1, not less than $16,400,000 shall be available for the purpose of "Graduate Student Support";

(4) of the total amount authorized under section 1, category (6), not less than $3,000,000 shall be available for "Undergraduate Research Participation";

(5) of the total amount authorized under section 1, category (6), not less than $2,500,000 shall be available for "Secondary School Student Science Projects";

(6) of the total amount authorized under section 1, category (6), not less than $2,000,000 shall be available for "Science Faculty Fellowships";

(7) of the total amount authorized under section 1, not less than $6,600,000 shall be available for "Science Information Activities";

(8) of the total amount authorized under section 1, category (4), not less than $25,000,000 shall be available for environmental research, including $5,500,000 for earthquake engineering;

(9) of the total amount authorized under section 1, category (4), not less than $23,000,000 shall be available for "Applied Social Research" and for "Policy-Sciences Research" directed toward increasing the cost-effectiveness of policies and programs dealing with urban and human service problems at the Federal,

FY 1977--Senate Authorization Subcommittee Report (94-888) on its Bill (S. 3202)

NSF Authorization Act, 1977 (PL 94-471) & Conference Report (H. 94-1689)

OBLIGATION LIMITATION

SEC. 403. Appropriations made pursuant to this Act shall remain available for obligation, for expenditure, or for obligation and expenditure, for such period or periods as may be specified in Acts making such appropriations.

INFORMATION REQUIREMENT

SEC. 404. Notwithstanding any other provision of this or any other Act, the Director of the National Science Foundation shall keep the Committee on Science and Technology of the House of Representatives and the Committee on Labor and Public Welfare of the Senate fully and currently informed with respect to all of the activities of the National Science Foundation.

Estus Smith, Vice President for Academic Affairs, Jackson State University; Jackson, Mississippi

In the development of the criteria for the award of planning grants for Minority Centers, S. 3202 directs the Foundation to work closely with groups which have been active in seeking greater recognition of the scientific and technical capabilities of minorities. The Committee also expects that the peer review panels established to consider applications for planning grants will include significant representation of minority scientists and educators.

Recognizing the care and thoughtful planning which must go into this new program if it is to be effective and the importance of the report which will be presented to the Congress on the results of the planning grants, the Committee strongly urges the Director of the Foundation to appoint a National Advisory Board to participate in the development and implementation of these activities. At least two-thirds of the members of the Advisory Board should be minority scientists.

S. 3202 also requires the Foundation to report to the authorizing Committees on Activities pursuant to this subsection not later than March 1, 1977.

6. OFFICE OF SMALL BUSINESS RESEARCH AND DEVELOPMENT

The National Science Foundation Act of 1950 establishes as an objective of the Foundation "to strengthen research and education in the sciences, *including independent research by individuals*, throughout the United States, and to *avoid undue concentration* of such research and education" (italics added). At no point in the Act is the Foundation prohibited from funding profitmaking research institutions, such as industrial laboratories or individual inventors and entrepreneurs. However, in practice it has largely refrained from doing so. Recently, this practice has begun to show some changes, however, particularly within the RANN Directorate, and primarily in response to Congressional direction. S. 3202 for example, calls for a 10% small business set-aside of RANN funds, and a preliminary study of the effects of broadening the funding pattern of the Foundation is requested elsewhere in this Report.

As a result of these changes, and conscious of the National Science Foundation's mandate to "appraise the impact of research upon industrial development and upon the general welfare", S. 3202 directs the Foundation to establish within the Office of Government and Public Programs an Office of Small Business Research and Development, the functions of which will be to:

(1) foster communication between the Foundation and the small business community; and oversee the administration of small business set asides to ensure their effective utilization;

(2) publish information on the grants awarded to small business by the Foundation, and the procedures adopted by the Foundation for handling small business proposals;

(3) assist small businesses in their dealings with the Foundation;

(4) recommend whatever changes in Foundation procedures it may see fit in order to draw fully on the resources of the small business research and development community;

(5) submit quarterly reports to the Congress.

In order to provide adequate funding to undertake such programs, S. 3202 authorizes grants (not to exceed $200,000) to any State, to pay a part of the cost of establishing or strengthening science, engineering and technology advisory offices within the Executive and Legislative branches of the State government. Individual proposals from either branch of State government, could be funded at levels up to $100,000 each, and all such funding would be on an 80/20 Federal/State matching basis. Each State would also be required to state its intention of assuming the full cost of any such office two years after receiving any such grant. This program has gained the widespread support of State and local government organizations, including the National Governors' Conference, the United States Conference of Mayors, the Federation of Rocky Mountain States, and the National Conference of State Legislatures.

8. ADVISORY COUNCIL TO THE NATIONAL SCIENCE FOUNDATION

The Committee welcomes the decision of the Foundation to establish an Advisory Council "to provide advice and counsel to the NSF Director and principal members of his staff on Foundation wide issues which require the expertise of the many and varied disciplines and program interests represented in the Foundation."

To ensure that the Council fulfills its purpose and that does not duplicate the policy and advisory responsibilities of the National Science Board S. 3202 requires that the Council, to be composed of twenty-four members, must include at least six individuals who are not scientists. S. 3202 further requires that the Council must furnish advice to the Board and the Director on broad policy matters relating to the activities of the Foundation, particularly science research and education policy, and that it must promote public understanding and access to information concerning the activities of the Foundation. The Committee recommends that the Advisory Council meet at least four times a year, in order to promote its ability to advise and make recommendations concerning ongoing and developing programs and activities.

The Committee endorses the Foundation's interest, as stated in the report "Public Participation—Findings and Plans" submitted in December of 1975, in obtaining "the views and interests of nonscience groups through a varied and extensive program of meetings and conferences" and urges the active pursuit of these activities in addition to the establishment of the Advisory Council.

With regard to the conclusion of the Public Participation Report that "the majority of the Foundation's future policies and activities will consist of a continuing development of the very substantial body of techniques and practices which has been built up over the years" the Committee wishes to stress that while these techniques and practices have proved effective in providing continuing contact between the Foundation and outside scientists, they have not been as successful in establishing a similar relationship between the Foundation and nonscientists. It is to this need which the Committee urges the Foundation to assign high priority in the effort to improve public participation.

may serve as catalysts to increase the useful application of science and technology in the society.

However, there are important economic barriers which may impede progress toward the twin goals of full productive employment and closer coupling of science and technology. Innovative, farseeing research rarely pays for itself in profits to the company sponsoring. Therefore, industrially funded research tends to be directed at making well defined, incremental changes in existing technology, rather than exploring the possibilities for radical breakthroughs. The latter are too unlikely and take too long to realize commercially when they do occur, for such a course to be considered cost effective. This is particularly true during inflationary periods.

The question, therefore, arises as to the proper role for the Federal government in general, and the National Science Foundation in particular, to play under these circumstances. The Committee requests the National Science Foundation to initiate a study of this set of problems, and to report its findings and recommendations to the Committee not later than December 31, 1976. The study should include, but not be limited, to the following elements:

(1) A description of current Foundation policy regarding the funding of research in other than educational institutions, and a brief review of how that policy has evolved over the years.

(2) A survey of the available data on the extent of scientific and technical resources in other than educational institutions.

(3) A description of anticipated problems and benefits of a policy which would broaden the funding patterns of the Foundation to include more support of nonacademic institutions, together with recommendations for changes, if any, in the present funding policy.

The Committee recognizes the importance of a careful examination of any proposed change in the funding policy of the Foundation. However, in the light of the very serious concerns expressed above, the Committee feels the time has come to initiate discussion of the long range options open to the Foundation in a rapidly changing situation, and it hopes that the proposed study will prove a useful first step in that discussion.

MANAGEMENT AND UTILIZATION OF SCIENTIFIC AND TECHNICAL INFORMATION

The Committee has devoted considerable attention to the extent and implications of the rapid growth of scientific and technical information. It views scientific and technical information is a major national resources and recognizes that the nation must plan, conserve and manage its utilization.

Information must be viewed as both the raw material and the end product of all research. Each experiment draws on existing information, and through its results, creates new information to add to the nation's storehouse of knowledge. Studies have shown that the average scientists spends over half his time in various forms of communication.

This has lead to the publication of over 30,000 journals, with over one million scientific papers each year. To help scientists digest this vast outpuring of information, there are over 300 abstract journals

Subsection (d) (1). This subsection authorizes and directs the Foundation in order to increase minorities in science, to award planning grants for programs, including but not limited to Minority Centers for Graduate Education in Science and Engineering at geographically dispersed institutions with substantial minority enrollment that are located near minority population centers. The Director shall consult with minority groups in establishing criteria for planning groups, and report to the House and Senate oversight committees on the results of these activities by March 31, 1977.

The sum of $2 million is earmarked for this program.

Section 206. The Foundation is directed to establish an Office of Small Business Research and Development within the Office of Government and Public Programs, in cooperation with the Small Business Administration to: foster communication between the Foundation and the small business community; collect and publish information concerning NSF awards to small business concerns and procedures for handling proposals for such concerns; assist small business concerns to obtain information about NSF programs and procedures and assure expeditious processing of proposals; recommend any changes required to increase the utilization of small business concerns; prepare a report on the scientific and technical expertise and capability in the small business community in collaboration with organizations representing small business concerns; and report quarterly to the Congress.

Section 207. This section authorizes the Foundation to make grants to states to increase their capacity to apply science, engineering and technology to meet the needs of their citizens. Grants of up to $100,000 each are authorized for the executive and legislative branches of state governments with at least 20% of the cost of their activities to be borne by the state receiving the grant.

The sum of $8 million is authorized for this program.

Section 208. This section authorizes NSF to establish a 24-member "advisory council" only if at least six of the members are non-scientists, and the council furnishes advice to the Board and the Director on broad policy matters relating to science, research and education and promotes public understanding and access to information concerning the Foundation.

Section 301. This section amends section 3(d) of the National Science Foundation Act to direct the Foundation to recommend and encourage the pursuit of national policies designed to foster research and education in science and engineering, and the application of scientific and technical knowledge to the solution of national and international problems.

Section 302. This section amends section 4(a) of the National Science Foundation Act by adding provisions that policies for the Foundation shall be established by the Board within the framework of applicable national policies as set forth by the President and the Congress. This section also amends section 4(c) of the National Science Foundation Act to include in the qualifications for membership on the Board eminence in industry to provide representation of the views of leaders from a diversity of points of field and points of view and to increase the number and broaden the range of organizations whose nominations for Board membership must be considered by the President.

scientific and technical knowledge to the solution of national and international problems.

(c) The National Science Foundation is authorized and directed to provide assistance to the Office of Science and Technology Policy established by the "Presidential Science and Technology Advisory Organization Act of 1976" (42 U.S.C. 6611).

(d) Notwithstanding any other provision of this or any other Act not less than 10 per centum of the amount authorized for category (5) of subsection (a) of this section shall be expended to small business concerns.

(e)(1) The National Science Foundation shall establish uniform procedures for establishing the responsibility for material published with the assistance of or under the sponsorship of the Foundation. The Foundation shall also establish procedures for reporting on the utilization of research projects assisted under the program "Research Applied to National Needs".

(2) The National Science Foundation shall arrange for the dissemination of all substantive technical reports through the National Technical Information Service of the Department of Commerce.

(3) In the conduct of the energy research and development activities under the "Research Applied to National Needs" category, the National Science Foundation shall coordinate all new energy research project awards with the Administrator of the Energy Research and Development Administration or his designee.

(f) The Director of the National Science Foundation is authorized and directed to conduct a feasibility study of operating the peer review system used in the evaluation of grant proposals within the Foundation so as to assure that the identity of the proposer is not known to the reviewers of the proposal. Any such system shall be considered to supplement and not to supplant the peer review system in operation in the Foundation on the date of enactment of this Act.

(g) No funds may be transferred from any particular category listed in section 2(a) to any other category or categories listed in such section if the total of the funds so transferred from that particular category would exceed 10 per centum thereof, and no funds may be transferred to any particular category listed in section 2(a) from any other category or categories listed in such section if the total of the funds so transferred to that particular category would exceed 10 per centum thereof, unless—

(1) a period of thirty legislative days has passed after the Director or his designate has transmitted to the Speaker of the House of Representatives and to the President of the Senate and to the Committee on Science and Technology of the House of Representatives and to the Committee on Labor and Public Welfare of the Senate a written report containing a full and complete statement concerning the nature of the transfer and the reason thereof, or

(2) each such committee before the expiration of such period has transmitted to the Director written notice to the effect that such committee has no objection to the proposed action.

The conferees agreed to adopt a number of the Senate provisions, but did not specify where the Office was to be located within the organizational structure of the Foundation. The conferees emphasized their support, however, of a Foundation-wide program to expand small business participation. The Foundation is also directed to report quarterly on these activities—a report which the conferees recommend be included as part of the quarterly reporting system already established by the Foundation.

The conferees also agreed to urge the Office of Science and Technology Policy, together with the Small Business Administration and the Foundation, to prepare a comprehensive report on the scientific and technical capability which exists in the small business community.

The conferees expect that this report will be carried out in collaboration with private sector organizations representing small business, and that it will address the serious gaps which exist in the data concerning the capabilities, utilization and growth potential of the small business sector in science and technology.

SECTION 9—NATIONAL SCIENCE BOARD

The Senate bill included a section amending the National Science Foundation Act of 1950 as it relates to the mission, composition, and staffing of the National Science Board. The House bill included no comparable provision.

The conferees agreed to adopt the Senate provisions amending the National Science Foundation Act to assure that the policies which the National Science Board establishes for the Foundation are "within the framework of applicable national policies as set forth by the President and the Congress." This addition establishes essential coordination between policies which the Board may set for the Foundation and those enumerated in Title I of the National Science and Technology Policy, Organization, and Priorities Act of 1976 (42 U.S.C. 6601-6602).

The conferees also agreed to adopt the Senate provision amending the National Science Foundation Act to raise the maximum grade level for staff for the National Science Board to the equivalent of the top grade in the classified service (GS-18). The $800 million budget for which the Board is responsible requires that it be supported by the best scientific and technical assistance obtainable within the Federal Government. The scaling upward of the grade level at which staff can be compensated is a partial attempt to address this very real need, and is expected by the conferees to result in the early appointment of staff members to serve the Board.

In order to ensure that the National Science Board keeps pace with its responsibilities and the broadened mission of the National Science Foundation, and to provide representation of the interests of all scientific fields, all levels of academic institutions, and all citizens, the conferees agreed to strongly recommend that: (1) persons eminent in the industrial sector be included in the membership of the Board; (2) greater attention should be given to Board representation by scientists whose special field is education research and by science educators from undergraduate institutions; (3) members of the Board be se-

lic Welfare, not later than March 1, 1977, with a detailed report on the program plan developed under this section, including recommendations for its implementation in fiscal year 1978.

MINORITIES, WOMEN, AND HANDICAPPED INDIVIDUALS

Executive position search. 42 USC 1873 note.

SEC. 7. (a) The Director of the National Science Foundation shall initiate an intensive search for qualified women, members of minority groups, and handicapped individuals to fill executive level positions in the National Science Foundation. In carrying out the requirement of this subsection, the Director shall work closely with organizations which have been active in seeking greater recognition and utilization of the scientific and technical capabilities of minorities, women, and handicapped individuals. The Director shall improve the representation of minorities, women, and handicapped individuals on advisory committees, review panels, and all other mechanisms by which the scientific community provides assistance to the Foundation. The Director of the National Science Foundation shall report quarterly to the Congress on the status of minorities, women, and handicapped individuals and activities undertaken pursuant to this section.

Quarterly report to Congress.

(b) Notwithstanding any other provision of this or any other Act, the National Science Foundation shall, with funds available from the program "Minorities, Women, and Handicapped Individuals in Science" conduct experimental forums, conferences, workshops or other activities designed to improve scientific literacy and to encourage and assist minorities, women, and handicapped individuals to undertake and to advance in careers in scientific research and science education.

Grants.

(c)(1) In order to promote increased participation by minorities in careers in science and engineering, the National Science Foundation is authorized and directed to make available planning and study grants for programs including, but not limited to, Minority Centers for Graduate Education in Science and Engineering in accordance with this subsection.

(2) The grants for Minority Centers for Graduate Education shall be used to determine the need for and feasibility of developing Centers to be established at geographically dispersed educational institutions which—

(A) have substantial minority student enrollment;

(B) are geographically located near minority population centers;

(C) demonstrate a commitment to encouraging and assisting minority students, researchers, and faculty;

(D) have an existing or developing capacity to offer doctoral programs in science and engineering;

(E) will support basic research and the acquisition of necessary research facilities and equipment;

(F) will serve as a regional resource in science and engineering for the minority community which the Center is designed to serve; and

(G) will develop joint educational programs with nearby undergraduate institutions of higher education which have a substantial minority student enrollment.

Criteria. Report to congressional committees.

(3) The Director, in consultation with groups which have been active in seeking greater recognition of the scientific and technical capabilities of minorities, shall establish criteria for the award of the grants, and shall report to the Committee on Science and Technology

FY 1978--Senate Authorization Subcommittee Report (95-93) on its Bill (S. 855)

NSF Authorization Act, 1978 (PL 95-99) & Conference Report (H. 95-504)

Dr. Norman Hackerman, President, Rice University and Chairman, National Science Board.
Dr. William A. Nierenberg, Director, Scripps Institution of Oceanography, Vice Chancellor for the Marine Sciences of the University of California, and member, National Science Board.
Dr. Edward C. Creutz, Acting Deputy Director for NSF and Assistant Director for Mathematical and Physical Sciences, and Engineering.
Dr. Harvey Averch, Assistant Director for Science Education.
Dr. Eliose E. Clark, Assistant Director for Biological, Behavioral, and Social Sciences.
Mr. Theodore D. Drury, Acting Director, Office of Government and Public Programs.
Dr. Alfred J. Eggers, Assistant Director for Research Applications.
Dr. John V. Granger, Acting Assistant Director for Scientific Technological and International Affairs.
Mr. Charles H. Herz, General Counsel.
Dr. Jack T. Sanderson, Director, Office of Planning and Resources Management.
Mr. Eldon D. Taylor, Assistant Director for Administration.
Dr. Edward P. Todd, Acting Assistant Director for Astronomical, Atmospheric, Earth, and Ocean Sciences.

Other witnesses who testified were:

Dr. Wesley W. Posvar, Chancellor, University of Pittsburgh (on behalf of the Association of American Universities, American Council on Education and National Association of State Universities and Land Grant Colleges).
Dr. T. R. Williams, Professor of Chemistry, College of Wooster (on behalf of great Lakes Colleges Association, Associated Colleges of the Midwest, American Association of State Colleges and Universities, and National Association of Independent Colleges and Universities).
Ms. Lillie K. Singleton, Institute Associate, Institute of Higher Education Research and Services, University of Alabama (on behalf of the American Association of Community and Junior Colleges).
Dr. William Jackson, Professor of Chemistry, Howard University (on behalf of the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers).
Dr. James E. Barger, Chief Scientist, Bolt Baranek and Newman, Inc., Cambridge, Massachusetts.
Dr. E. Jr. Johnson, G. T. E. Laboratories, Inc., Waltham, Massachusetts.
Dr. Arthur S. Therall, President, General Technical Services, Inc., Upper Darby, Pennsylvania.
Mr. Tersh Boasberg, Boasberg, Hewes, Finkelstein & Klores.
Dr. James Sullivan, Center for Science in the Public Interest.

Written testimony was submitted by:

Dr. Joseph E. Cicero, President, American Mathematical Association of Two Year Colleges, Clayton Junior College, Morrow, Georgia.
Miles Mark Fisher, IV, Executive Secretary, National Association for Equal Opportunity in Higher Education, Washington, D.C.

Correspondence expressing support and interest in the National Science Foundation's program was received from:

1. Academic and Industrial Basic Research Capability

The National Science Foundation Act of 1950, as amended, authorizes and directs the Foundation to "initiate and support basic scientific research and programs to strengthen scientific research potential in the mathematical, physical, medical, biological, engineering, social and other sciences, by making contracts or other arrangements (including grants, loans, and other forms of assistance) to support such scientific and educational activities and to appraise the impact of research upon industrial development and upon the general welfare;"

The Subcommittee, therefor, examined the need for the Foundation to mobilize the efforts of the scientific community to solve critical problems, whether the researchers themselves are located at universities or in private industry. Furthermore, as other federal agencies have been directed to fund only mission-oriented research, the Committee was particularly anxious to preserve the unique objectives of the National Science Foundation.

Witnesses before the Subcommittee testified that the essential feature of the private, profit-seeking industrial firms which could contribute to the nation's basic research efforts is their interdisciplinary nature. They are founded as problem-focused organizations and are staffed by scientists trained to do basic research. These men and women choose to work in the private profit-seeking industrial sector because of their desire to conduct their research in a problem-focused rather than in a disciplined-focused environment. In this environment, they carry out basic research to the point where economically attractive products and services can be demonstrated.

The "Report of the NSF Industry Relationships Committee", prepared for the National Science Foundation in 1972, described these private profit-seeking firms as follows: "This group has been, in the past, far more than proportionately productive of innovations."

Recent employment statistics for Ph. D.-trained scientists also showed that 45 percent of those primarily engaged in basic research are employed by private, profit seeking industrial organizations.[1] Our national policy for scientific advancement should recognize this capacity. It should be recognized also that these industrially-employed researchers are not now a neglected nor wasted scientific resource since their abilities are being utilized for privately-funded basic research. There are, therefore, various means by which the N.S.F. can focus on this resource, all of which must be carefully developed and gradually implemented.

The Committee was concerned, however, that the National Science Foundation policy giving priority to research in the academic sector, with a resulting scarcity of funds for industrial sector basic research may be too restrictive in the long run. Only 6% of federal funds for basic research now go to researchers in industrial firms. This policy has resulted in National Science Foundation funding to private, profit-seeking industrial organizations of only about $4 million per year for basic research. These obligations represent only about one-half of one percent of total National Science Foundation obligations.

[1] Surveys of Science Resource Series, National Science Foundation, NSF 76-323.

seeking organizations would require their adherence to the other criteria and policies detailed in "Grants for Scientific Research" (NSF 73-12).

In November, 1976, the National Science Board reviewed the Task Force Report and acknowledged the first three recommendations. The Board, however, adopted a resolution to strike recommendation number 4 that is it voted to retain special criteria for all grants to private profit seeking organizations.

The Committee believes the Board's action indicated its desire to maintain the general policy that "non-educational institutions would be excluded from the NSF research competition". Appendix 3 of the NSF December 1976 "A Report on Research in Industry: Roles of the Government and the National Science Foundation", stated the underlying rationale for this policy reflected the limitation of available funds, the value of training scientists in research projects at educational institutions, and the possible conflict of interest of profit seeking institutions, and the general recognition that public funds should not go to private persons without substantial assurances of public benefit.

Caution is required before making a major change in federal policy affecting basic research support for universities and colleges. The special criteria proposed to be deleted have applied for substantial number of years to National Science Foundation grants to persons in private industry. These criteria were established by the National Science Board to carry out the primary role of the National Science Foundation in the national research and development effort to strengthen the total science capability of the Nation through support of fundamental research of the highest quality. Because the academic environment is the unique source of new scientists and engineers in basic research the Board felt that the most important role for the National Science Foundation was to assure the support necessary to enhance the potential of basic science disciplines in academic institutions. However, in recognition of the value to the national scientific effort of basic research conducted by private industry, the National Science Foundation has supported very limited research in the private sector, but only under conditions where it meets one or more of three special criteria i.e. shows promise of solving an important scientific problem, unique resources are available in industry for the work, or the proposal is outstandingly meritorious.

The Committee does not expect that implementation of the fourth recommendation of the Task Force will be done at the expense of University supported research which relies heavily on federal support. The availability of that support for basic research in the universities has served as an inducement to young scientists to remain at such institutions and to retain the strength of the institutions' scientific capability. The Special Budget Analysis for fiscal year 1978 for Research and Development indicates that only twelve percent of all federal research and development expenditures are given to universities and colleges; and that only six percent represents basic and applied research other than medical research. However, the federal awards represent two-thirds of the research and development budgets of these

for private funding support of existing research efforts. NSF support should be limited to new research efforts which would not and could not be undertaken without that support.

2. Sustained Support for Applied Research [Sec. 5. (b)]

It is the Committee's view that the application of research results to national needs could be enhanced by N.S.F. through the award of sustaining support to teams of researchers qualified to build links between science, government, industry and the public. Such awards are authorized in S. 855.

The committee is concerned that many research organizations are viewed as potentially biased, because their findings may be contrained by the policies of their parent institutions or because they may be influenced by funding which comes from sectors of government or private industry which have a vested interest in the outcome of the research. Because research by such organizations may lack credibility when it is used as the basis for policy decisions, an effective alternative must be explored—an alternative through which institutions conducting applied research could receive sustained support from an agency which has neither a promotional nor a regulatory role with regard to the results of a particular research project.

Sustained support from N.S.F. would enable an independent interdisciplinary research capacity to be built and maintained. Based on the support provided, the projects would be carried out in problem areas identified by N.S.F., as well as independent research relevant to national needs.

This approach, which N.S.F. is uniquely qualified to implement, is particularly promising for the following reasons:

(1) It would develop a pool of personnel experienced in carrying out applied, interdisciplinary research. At present, the presonnel base for this activity is very limited, especially, for example, in the availability of social scientists with experienced in problem-focused assessments of scientific and technical questions. Because such integrated research requires unique methodologies, competence is developed through experience. Without institutional support, experienced individuals move on to other projects, and the learning process must continually be repeated.

(2) It promises the best chance for credible and objective findings. Credibility requires that the survival of a research organization not depend on reporting particular conclusions; sustained financial support from an independent agency removes this significant source of concern. In addition, credibility requires openness: broad participation by all interested parties in the research process, and publication of research results without the constraint of agency or client approval. Sustained support from N.S.F. could be very effective in providing this credibility in the eyes of the users of the research.

(3) It offers advantages in assuring the utilization of research results. The personnel resources developed by these independent groups would be available to devote the extensive effort frequently required to assist the nonscientific community in using the results of research that has been completed. It is the Committee's view that an important criteria of applied research is its utility, which is significantly in-

science teachers with training in teaching methods which encourage students to explore the interaction between science and society.

Uri Zoller and Fletcher Watson of the Harvard University Graduate School of Education, describe the need for this emphasis as follows in Science Education:

> As we are reminded almost daily, a major educational challenge of our time is the development of the human capacity to shape wisely and adapt actively to the rapidly changing modern technological society. This is a critical need, which must be met in part through educational institutions. Therefore, appropriate curricula should be implemented within the framework of schools in order to move toward meeting this need. Indeed, preparing young people for joining the adult community as capable and efficient "decision-makers," regardless of their diverse future careers, is a basic educational problem confronted by today's society. This problem relates both to the needs of a democratic society and to the needs of the individual. For the development of the students, both adaptability and plasticity are implied. Adaptability is necessary for copying wisely with his environment at the present, and plasticity is necessary for active adjustment and integration within the society of the future. An individual with such developed capabilities will be better to live at his fullest capacity as a creative agent of intelligently controlled change. Although, the need is worldwide, it is receiving only sparse attention.

The Committee believes that institutes for pre-college teachers, lasting for two or three weeks, could provide instruction and encouragement for science teachers to include in their instructional programs more material about the interaction between science and society. This approach would draw on the technical knowledge of the teachers and improve their ability to present material on topics increasing concerning to society as a whole. While ecological and energy problems, which do interrelate science with social and policy decisions, are presented by some science teachers, these are but two of the many problems involving the application of scientific knowledge to social and policy decisions.

The Committee also wishes to encourage the Foundation to continue to support new curricula for use at the pre-college level. The Committee believes that this effort should be focused particularly on the needs of the nonscience student—the student who nevertheless will have to deal with numerous scientific and technical issues as an adult in our society.

5. Instrumentation [*Sec. 5(c)*]

The Committee endorses the Foundation's decision to increase funding for instrumentation, facilities, and research resources. The Committee has approved full funding for this effort.

The Committee has also earmarked 15 percent of these funds for the purchase of instruments costing $25,000 or less. This provision is included to ensure that relatively inexpensive pieces of equipment—

made or attempted by appropriate House committees; (2) evidence of a carefully considered 1979 budget for NSF by the Foundation itself is not available; (3) there are disadvantages as well as advantages to be considered in adopting a 2-year budget cycle—and these have not yet been thoroughly explored.

SECTIONS 2 AND 3—FUNDS

1. For Mathematical and Physical Sciences and Engineering, the budget request of the National Science Foundation was $249,200,000. The House authorized $243,800,000 and the Senate authorized $249,200,000. The conferees agreed on $246,500,000.

2. For Astronomical, Atmospheric, Earth and Ocean Sciences, the budget request of the National Science Foundation was $213,400,000. The House authorized $207,600,000 and the Senate authorized $213,400,000. The conferees agreed on $210,500,000.

3. For the United States Antarctic Research Program, the House, the Senate, and the conferees approved the Foundation request for $47,475,000.

4. For Biological, Behavioral, and Social Sciences, the budget request of the National Science Foundation was $144,800,000. The House authorized $139,200,000, and the Senate authorized $145,800,000. The conferees agreed on $142,500,000, including an increase of $500,000 in the support of research on nitrogen fixation.

5. For Basic Research Stability Grants there was no request by the National Science Foundation. The House authorized no funds, and the Senate authorized $6,800,000 or 2 per centum of the funds available for categories (1), (2), and (4) above, whichever is less, for a new program. The conferees agreed on $4,500,000 or 2 per centum of the funds available for categories (1), (2), and (4) above, whichever is less, with the stipulation that the Basic Research Stability Grants program will replace the Research Initiation and Support program.

6. For Science Education Programs, the budget request of the National Science Foundation was $75,700,000. The House authorized $83,300,000 and the Senate authorized $83,900,000. The conferees agreed on $83,300,000.

This amount includes the following:

a. For Graduate Fellowships the budget request was $11,400,000. The House recommended $11,400,000 and the Senate authorized $12,500,000. The conferees agreed on $11,900,000.

b. For Continuing Education for Scientists and Engineers the budget request was $1,200,000. The House authorized not more than $600,000, and the Senate authorized $1,200,000. The conferees agreed on $1,200,000.

c. For a Resource Center for Science and Engineering the budget request was $1,000,000. The House authorized not more than $1,000,000, and the Senate authorized $6,000,000. The conferees agreed on $3,000,000.

d. For Minorities, Women, and the Handicapped in Science the budget request was $2,000,000. The House recommended $2,000,000, and the Senate authorized $3,000,000. The conferees agreed on $2,500,000.

The House authorized $21,200,000, and the Senate authorized $20,600,000. The conferees agreed on $20,900,000.

Of that amount, for Policy Research and Analysis the budget request was $4,000,000. The House authorized not less than $4,500,000, and the Senate authorized not more than $2,000,000. The conferees agreed on $4,000,000.

9. For Program Development and Management, the House, the Senate, and the conferees approved the Foundation request for $47,825,000.

SECTION 4

Section 4(a)—Academic and industrial participation in NSF-supported programs

The Senate bill included a provision to permit researchers in the industrial sector to compete for basic research support on an equal basis with researchers in the academic sector. The Senate bill also: (1) authorized fellowships to enable academic researchers to spend up to two years in an industrial environment and to allow industrial researchers to spend up to two years in an academic environment, and (2) directed the Foundation to increase support for cooperative research projects involving researchers from the industrial and academic sectors. The House bill included no comparable provisions.

The conferees agreed to adopt the Senate provision with regard to cooperative research projects.

The conferees further agreed that fellowship exchange programs between universities and industries could improve the interaction between the two sectors to their mutual benefit and to the benefit of U.S. science and technology. The conferees therefore urge the Foundation to use funds authorized in the bill for Science Manpower Improvement to make such fellowships available.

With regard to competition for basic research support, N.S.F.'s organic Act does not require the use of special criteria in evaluating industrially-based research proposals. Rather, the application of such criteria is the result of National Science Board policy.

The conferees noted that although the 1976 National Science Foundation Report "Research in Industry: Roles of the Government and the National Science Foundation" explicitly reaffirms the Board's policy with regard to industrial participation in basic research programs, it also acknowledges that there is "a range of opinion on this policy among members of the National Science Board as well as the staff of the National Science Foundation" and states that "the National Science Foundation will periodically review this policy to determine if it continues to be appropriate."

In reviewing this Report and the hearings record compiled by the House Committee on Science and Technology and the Senate Committee on Human Resources, the conferees agreed that the Foundation should proceed cautiously in making policy changes which might affect established funding patterns to any significant degree, particularly since those funding patterns have been well received by the Congress as a whole and by most of the scientific community throughout the Foundation's existence. At the same time, the proposals of industrially-based basic researchers should not be systematically excluded from consideration. Hence the conferees concur that industrial researchers should be made aware that their proposals are eligible for

Urban and human services problems.

(c) Of the appropriations made pursuant to section 2(b)(7), not less than 25 per centum shall be available for "Applied Social Research" and for "Policy-related Scientific Research" directed toward increasing the cost-effectiveness of policies and programs dealing with urban and human service problems at the Federal, State, and local government levels, including use of such funds to identify, analyze, and contribute knowledge to improve productivity in the public sector, to identify, analyze, and evaluate more effective, efficient, and equitable ways of delivering human services, and to develop the data base and analytical techniques required for improving applied research on municipal systems and human service delivery.

Cooperative research projects.

SEC. 4. (a) From funds authorized under section 2(b) (1), (2), and (4) the National Science Foundation is authorized to increase support for cooperative research projects involving researchers from the industrial and academic sectors.

Small business concerns.

(b) Notwithstanding any other provision of this or any other Act, not less than 12.5 per centum of the amount provided under section 2(b)(7) shall be available for small business concerns.

Bilateral and multilateral research programs.

(c) In the use of the funds made available pursuant to section 2(b)(8) for "International Cooperative Scientific Activities", emphasis shall be placed on bilateral and multilateral research and exchange programs, particularly programs involving Western Europe and neighboring countries in the Western Hemisphere. The Director of the National Science Foundation shall consult with the Director of the Office of Science and Technology Policy, the Secretary of State, and other appropriate officials to assure that the programs carried out under this subsection are consistent with the international scientific and foreign policy objectives of the United States.

Science and technology. 42 USC 1862 note.

SEC. 5. (a) From the funds authorized under the program "Science and Society", the National Science Foundation is authorized to provide support which is designed to—

(1) improve public understanding of public policy issues involving science and technology;

(2) facilitate the participation of qualified scientists and engineers and of undergraduate and graduate students in public activities aimed at the resolution of public policy issues having significant scientific and technical aspects; and

(3) assist nonprofit, citizens, and bona fide public interest groups to acquire necessary scientific and technical expertise in order to improve their comprehension of scientific and technical aspects of public policy issues.

(b) Awards made pursuant to this section shall, to the extent feasible, include support for—

(1) qualified scientists and engineers to work on public policy issues with significant scientific and technical components in conjunction with units of State and local government, nonprofit organizations, or bona fide public interest groups;

(2) internship programs for science and engineering undergraduate or graduate students to work on public policy issues with significant scientific and technical components in conjunction with units of State and local government, nonprofit organizations, or bona fide public interest groups as part of their academic training;

(3) forums, conferences, and workshops on public policy issues with significant scientific and technical components;

(4) training in the presentation of scientific and technical studies in a manner which (A) improves public understanding of

Public Law 95-434
95th Congress

An Act

To authorize the appropriation of specified dollar amounts for each of the National Science Foundation's major program areas (and certain subprograms), and to provide requirements relating to periods of availability and transfers of the authorized funds.

Oct. 10, 1978
[H.R. 11400]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "National Science Foundation Authorization Act for Fiscal Year 1979".

National Science Foundation Authorization Act for Fiscal Year 1979.

SEC. 2. (a) There is hereby authorized to be appropriated to the National Science Foundation for the fiscal year 1979 for the following categories:

(1) Mathematical and Physical Sciences and Engineering, $265,700,000.

(2) Astronomical, Atmospheric, Earth, and Ocean Sciences, $221,700,000.

(3) United States Antarctic Program, $51,200,000.

(4) Biological, Behavioral, and Social Sciences, $157,000,000.

(5) Science Education Programs, $81,800,000.

(6) Applied Science and Research Applications, $69,700,000.

(7) Scientific, Technological, and International Affairs, $23,500,000.

(8) Program Development and Management, $53,300,000.

(b) Of the total amount authorized under subsection (a)(6)—

(1) $2,000,000 is authorized for a "Handicapped Research Program";

(2) $200,000 is authorized for the design of a program in Appropriate Technology; and

(3) not less than 12.5 per centum shall be expended to small business concerns.

SEC. 3. Appropriations made under the authority provided in sections 2 and 5 shall remain available for obligation, for expenditure, or for obligation and expenditure for periods specified in the Acts making the appropriations.

SEC. 4. From appropriations made under this Act, not more than $5,000 may be used for official consultation, representation, or other extraordinary expenses upon the determination of the Director of the National Science Foundation, and his determination shall be final and conclusive upon the accounting officers of the Government.

Limitation.

SEC. 5. In addition to the sums authorized by section 2, not more than $1,500,000 is authorized to be appropriated for the fiscal year 1979 for expenses of the National Science Foundation incurred outside the United States, to be paid for in foreign currencies that the Treasury Department determines to be excess to the normal requirements of the United States.

SEC. 6. Funds may be transferred among the categories listed in section 2(a), but neither the total funds transferred from any category nor the total funds transferred to any category may exceed 10 per centum of the amount authorized for that category in section 2, unless—

Transfer of funds.

(1) thirty legislative days have passed after the Director of the National Science Foundation or his designee has transmitted to

89-139 O - 79 (2nd)

Calendar No. 782

95TH CONGRESS
2D SESSION

S. 2549

[Report No. 95-851]

IN THE SENATE OF THE UNITED STATES

FEBRUARY 21 (legislative day, FEBRUARY 6), 1978

Mr. KENNEDY (for himself, Mr. HATHAWAY, Mr. JAVITS, Mr. NELSON, Mr. PELL, Mr. RANDOLPH, Mr. RIEGLE, Mr. SCHWEIKER, and Mr. WILLIAMS) introduced the following bill; which was read twice and referred to the Committee on Human Resources

MAY 15 (legislative day, APRIL 24), 1978

Reported by Mr. KENNEDY, with an amendment

[Strike out all after the enacting clause and insert the part printed in italic]

A BILL

To authorize appropriations for the activities of the National Science Foundation, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

~~That this Act may be cited as the "National Science Foundation Authorization Act for Fiscal Years 1979 and 1980".~~

~~SEC. 2. (a) There is hereby authorized to be appropriated to the National Science Foundation $934,000,000 for the fiscal year 1979 and such sums as may be necessary for the fiscal year 1980.~~

~~(b) Funds authorized for the fiscal year 1979 shall be available for the following categories:~~

solicitation. With funds available for fiscal year 1980 the Foundation is to establish a third center selected in a similar manner.

The $35.9 million authorized for fiscal year 1980 will provide support for the continuation of fiscal year 1979 efforts, with increased support for assisting colleges and universities in improving the quality of science education.

Science Education Development and Research ($11.7 million for fiscal year 1979; $13.2 million for fiscal year 1980.—The fiscal year 1979 authorization provides funds to improve the quality and diversity of the science education system and to further the basic understanding of science by all citizens. Methods for accomplishing this goal include: Developing innovative technologies, methods of instruction, delivery systems and instructional materials; and generating new knowledge and theory as a basis for significant change in education in the sciences. In fiscal year 1979, significant attention will be given to science education in grades 7 through 9.

The $13.2 million authorized for fiscal year 1980 will continue support for the fiscal year 1979 efforts, with additional emphasis on activities for junior high school science education.

As a result of earlier committee concerns, the Foundation has incorporated into its current grant policy manual specific compliance instructions and procedures for grantees of projects which involve precollege students in experimental curriculum development projects. These instructions provide for local consent and parental review of experimental or innovative curriculum developed with NSF funds.

In response to the committee's recommendation and authorization for fiscal year 1978, the Foundation has initiated the assessment of science education in the 2-year college program. The assessment program has two components: One, national and comprehensive; and the other local and focused. Thus far, the local component has received 62 proposals, in response to which the Foundation will make 36 awards of approximately $5,000 each. The guidelines for the comprehensive component have been issued recently. One solicitation award of $200,000 will be made by this component in time for a September 1978 starting date.

An ad hoc committee has been chartered and appointed for the assessment program. The committee will: Offer expertise and advice on comprehensive proposals, provide oversight on the program, and examine reports and make recommendations to the Foundation.

Science and Society ($7.9 million for fiscal year 1979; $9 million for fiscal year 1980).—The fiscal year 1979 authorization will support efforts to improve public understanding of science and technology; to increase knowledge and understanding of the ethical and social implications of development in science and technology; and to encourage and facilitate the participation of scientists and nonscientists in public activities, including the provision of scientific and technical expertise to citizens and citizen groups, related to the resolution of policy issues.

S. 2549 authorizes $1.8 million for the ethics and values in science and technology program. Emphasis is placed on training programs and seminars to encourage increased involvement of scientists and and others concerned with ethics in this program and on augmenting research for increasing the understanding and interaction among the scientific and technological communities, other professional communi-

the bill requires that not less than 15 percent of the funds are to be expended to small business firms.

The Foundation's ASRA activity largely replaces and modifies the former Research Applied to National Needs (RANN) program. The ASRA activity includes five subactivities: Problem Analysis, Integrated Basic Research, Applied Research, Problem-Focused Research Applications, and Intergovernmental Science and R. & D. Incentives.

The authorization provides $2 million for the Problem Analysis program for fiscal year 1979 and $2.26 million for fiscal year 1980. This compares to a fiscal year 1978 level of $1.5 million. The goal of the Problem Analysis subactivity is to identify and analyze major national problems with significant scientific content, and to provide a preliminary assessment of the appropriate role of science and technology, the Federal Government and the NSF in their solution.

Studies are made on a wide range of potential research topics and problem areas which provide the basis for applied research initiatives. The ASRA problem analysis work gives NSF greater capability to respond to changing national priorities, to identify emerging problem areas, and to take advantage of applied research opportunities.

The authorization includes $7 million for fiscal year 1979 and $7.93 million for fiscal year 1980 for the Integrated Basic Research subactivity. This compares to a level of $1.9 million in fiscal year 1978. The goal of the Integrated Basic Research (IBR) is to improve the Nation's ability to deal with major, long-term problems through increased basic research in areas perceived as most relevant.

NSF is in the process of identifying problem areas for IBR funding. Examples offered by NSF to suggest the nature and scope of such support are interdisciplinary research on the global carbon cycle, which could be important in the development of some aspects of long-term national energy policy; and approaches in molecular biology, biophysics and biochemistry and microorganisms of plants that could lead to improvements in agricultural production. The committee also directs the Foundation to assure that basic research proposals receiving IBR funding are selected with particular care and that, to the maximum extent possible, proposals selected have unusual potential for important results.

S. 2549 includes $17.5 million for the Applied Research subactivity for fiscal year 1979, which together with $3.4 million of carryover funds provides a total of $20.9 million for that year. S. 2549 also includes $19.82 million for fiscal year 1980. The Applied Research subactivity provides improved scientific understanding of a range of technical, social, economic, and policy problems and seeks to increase the rate of technological innovation growing out of significant discoveries in the various fields of science and engineering. Principal areas of emphasis are: Public policy and regulation; public service delivery and urban problems; industrial organizations and markets; productivity and its relationship to research and development; individual and group processes; biological and ecological applications; research to facilitate the rate of technological innovations in industrial processes; and geophysical and environmental applications.

S. 2549 sets aside $2 million in fiscal year 1979 and $2.26 million in fiscal 1980 for a Handicapped Research Program. This program will support projects to apply science and technology to the needs of the

there was too little time for the NSF adequately to prepare a second year budget, and that the House had not thoroughly explored the advantages and disadvantages of a 2-year authorization.

In view of the introduction of new budget techniques such as zero base budgeting, mission budgeting, and the recent instructions of the administration for advanced or multiyear budgeting, the committee feels that the 2-year NSF authorization included in S. 2549 is both timely and feasible, and intends to press for its enactment into law.

Basic research

Basic research is the foundation for scientific and technological achievement. Understanding the structure and behavior of matter, the study of chemical reactions, gaining insights into human behavior, and understanding and discovering the underlying causes of inflation, unemployment, and other problems of society can contribute to improvement in the quality of life. The key is new knowledge much of which can be gained through basic research in the sciences and engineering.

Basic research supported by NSF has opened new possibilities for safe biological control of insect pests, for augmenting crop production through stimulation of nitrogen fixation and for understanding how the brain functions and repairs itself. Advances in materials science, chemistry, physics and computer sciences offer new possibilities for improving metals and other materials and are providing new knowledge of the structure and behavior of matter. New capabilities for measurement and research on submicron structures have the potential for leading America into a whole new generation of miniature technology tens of thousands of times more refined than anything available today.

In terms of scientific progress, the research programs of NSF suggest that in spite of the tremendous scientific progress made in this century, we have only scratched the surface of the achievements that can be realized through further scientific advancement.

The committee has authorized the full amount of $755 million included in the NSF budget for fiscal year 1979 for basic research activities. This is an increase of 9.8 percent above the fiscal year 1978 basic research support level funded by NSF. The committee has also authorized $854 million for basic research activities in fiscal year 1980. This is an increase of 13.2 percent above the fiscal year 1979 authorization.

Industry/university cooperative research

The National Science Foundation, in carrying out its responsibility to strengthen basic research, must rely on the talents of academic and industrial researchers.

Such efforts will enable the Foundation to insure that its programs make the maximum use of the sizable research capability which exists in the industrial sector. The cooperative programs will insure that the outstanding basic researchers who work in industrial laboratories have an opportunity to contribute their skills to the research projects supported by the Foundation.

The Director of the Foundation testified before the committee that industry and universities can both benefit from expanding opportunities for cooperative research. Similar testimony was presented on behalf of the Association of American Universities, the American

Mr. SPIRA. There has been a discussion among the House and Senate committees of this program. We consider it to be an innovation of the first class, coupling the Government and the private sector and the R. & D. area with the market.

The chairman has requested that I ask whether it would be appropriate that the originator of this program be considered for recommendation for one of the major civil service awards, such as the Rockefeller Award.

Dr. SANDERSON. I think that would be a very considerate and appropriate thing to do. It certainly has proved an approach which has won the support, not only of the universities but of the small business community itself.

In terms of some of the earlier discussion you have had, the idea behind this program has proved creative. It recognizes the motivation, the energy, the willingness to risk one's career and one's "take a mortgage on the house in order to meet the payroll" entrepreneurial desire of creative people in our society.

It attempts to lower the front-end risk for this organization, recognizing that in general the innovators have the motivation and they can obtain, through venture capital sources, the backing to take the product to market once they can prove that their idea is sound.

Through this program we are really trying to lower that front-end risk and at the same time to encourage venture capital at an early date to provide the incentive to take the product into the market. We want to see if it does not stimulate the innovation process. The evidence today indicates that it does.

Mr. SPIRA. Thank you very much.

Mr. GLOVER. I have a couple of areas.

What was the percent for small business before the first Congressional minimum awards went into place? Could you give us that figure? It was 7.5 percent afterward. Then what was it?

Dr. SANDERSON. Yes. I think it was running about half of that amount. It was running something in the neighborhood of 4 or 5 percent before the minimum was put in.

Mr. GLOVER. Do you believe that the National Science Foundation program for small business would have achieved the objective that it has without the minimum small business amounts that were established by Congress in the various years?

Dr. SANDERSON. The minimums certainly were a strong incentive to go out and succeed. To be perfectly candid, the answer is no. There were, and there are, a variety of issues and concerns that our agency must face. The recognition by the Congress of the importance of this issue certainly helped us to focus our attention on it.

Mr. GLOVER. I have one further question on this.

Could you also supply the small business data concerning basic research, as well as applied, so we will have both figures?

Dr. SANDERSON. Certainly.

Mr. GLOVER. Without objection, so ordered.

I have no further questions.

[Recess taken.]

Representative BRECKINRIDGE. The committees will come to order.

There are several more encompassing study activities that have segments addressing Federal procurement policies and R. & D. For example, the Industrial Innovation Coordination Committee is conducting the domestic review on industrial innovations. I understand you will have the science advisor and the Under Secretary of Commerce appear to review this among other activities. Another domestic policy group is examining solar energy options for the President. This group will address Federal procurement policies that may provide leverage for obtaining or which are inhibiting achievement of solar energy objectives. We will be involved with these studies and most certainly will be intensely involved with any procurement policy or regulatory implementing actions. I cannot, of course, forecast how these studies will come out, but our objective is to remove inhibitors to innovation, which includes inhibitors to small high technology businesses.

Total Federal R. & D. expenditures have nearly doubled since 1965, but Federal R. & D. as a percent of the total Federal budget has declined from 12 percent of the Federal budget down to about 6 percent. In that same period there has also been a 10-percent decline in industry participation in Government-sponsored research and development. Small business participation in research and development has, however, maintained about 3.5 percent of the total research and development dollars. This currently equates to 8 percent of the total that goes into industry.

One agency, the National Aeronautics and Space Administration—NASA—in fiscal year 1977 had 9 percent of its awards made to small business. For new work with new contracts over $10,000—22 percent went to small business. By including subcontracts from some 87 of NASA's prime contractors, 18 percent of NASA's total fiscal year 1977 awards were made to small business. This addresses small business recipients of R. & D. funded contracts, and should not be interpreted to mean that all of these awards were made to small high technology firms.

I will now address the actions taken by OFPP.

When Mr. Fettig joined OFPP as the Administrator, he found there were several projects on various aspects of small business—in general—minority business, and smaller R. & D. firms. These were individual efforts within the Office of Federal Procurement Policy.

He felt it would be wise to integrate these efforts toward common objectives and eliminate some of the duplication and overlap which became obvious when each of these initiatives was reviewed in an overall context. To this end we have been working on a small business plan for several months. Although we are proceeding with some specific elements of the plan, the plan is linked into a White House Conference next year. Early on, he recognized the necessity for special emphasis and appointed a special assistant as a focal point for small and minority business matters. This was an effort to also insure integration of the activities within the organization.

We have analyzed how innovative ideas are converted into viable commercial products that may both serve the public and fill Government needs. We found most of the problems can be addressed in three rather distinct phases of activity:

One, activities which involve innovative technology development and demonstration;

encouraging agencies acquiring major systems to use incentives to expand prime contractors' use of small businesses—including high technology small businesses.

We have taken other actions in which we have tried to remove some of the inhibitors to greater participation by small high technology firms. For example, we had a project to improve communication in the announcements in the Commerce Business Daily—CBD—and make them more accessible to all businesses. We have encouraged agencies to synopsize their research and development projects earlier in the CBD and in pamphlets that can be widely distributed to assist the small high technology businessmen to more readily identify Government interests.

The National Science Foundation, NASA, and the Department of Energy have such initiatives. Other agencies use periodic briefing to industry, large and small, in their areas of interest. The Navy has been using this technique for several years to announce its areas of R. & D. emphasis to interest those with new and innovative ideas. We have an initiative to use basic agreements with contractors to simplify and accelerate the contractual coverage for subsequent contracts. It steamlines and simplifies the paperwork. We have also had an emphasis on the fast pay for performers, especially small performers who cannot financially afford to wait for long periods to be paid by the Government. Last, but not least, small business has been exempted from the cost accounting standards. This, too, should remove a significant barrier to participation of small high technology businesses as either Government prime contractors or subcontractors.

It has been stated though the years that small high technology firms are far more innovative than large firms. We felt the subject was worth studying to develop information regarding the derivation of innovations. We found in the study that was done, which was reviewed by an interagency panel, that the available information was subjective but confirmed that small firms are more innovative than large firms. Whether it was subjective or not, if innovation does occur, we want to sponsor if wherever it occurs. So, we feel that removing the inhibitors to innovation by small high technology firms is certainly a reasonable and beneficial objective.

I turn now to what is being done.

One area which will aid in removing inhibitors to participation in Government business by small high technology firms is in profit policy. We are examining profit with a view to giving greater recognition to desired capital plant and facilities investments by small high technology firms as well as others. Such a policy has been recognized in the Department of Defense and by CAS Board Standard 414. We are looking at the implications of applying that profit policy across the Federal Government.

Another activity in which we are participating is the policy implementation of Public Law 95–224, which differentiates between assistance and procurement. There has been draft interim guidance published in the Federal Fegister that prohibits the use of grants to circumvent competitive procurement policies and, when appropriate, permits research grants to be used with profitmaking organizations. This expands that market for small high technology firms.

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

OFFICE OF FEDERAL
PROCUREMENT POLICY

HOLD FOR RELEASE UNTIL DELIVERY
Expected at 9:30 a.m.
Monday, June 26, 1978

STATEMENT BY THE
HONORABLE LESTER A. FETTIG
ADMINISTRATOR FOR FEDERAL PROCUREMENT POLICY
OFFICE OF MANAGEMENT AND BUDGET
BEFORE THE SUBCOMMITTEE ON
MONOPOLY AND ANTICOMPETITIVE ACTIVITIES
OF THE SENATE
SELECT COMMITTEE ON SMALL BUSINESS

Mr. Chairman and Members of the Subcommittee:

I am pleased to have the opportunity to appear here today and give the views of the Office of Federal Procurement Policy (OFPP) on Government patent policy and contribute to these hearings on the use of Institutional Patent Agreements (IPAs) as an implement of that policy.

Mr. Chairman, I believe the question of the use of IPAs should be answered in the context of overall Federal Government patent policy. While I am not in the position to present to the Subcommittee the Administration's view on the subject, I will share with you my thinking on patent policy. Further, patent policy is not an isolated issue and needs to be put in the context of a number of related policies.

Procurement vs. Assistance

Second, it should be equally appropriate to review Public Law 95-224 which distinguishes between procurement and assistance transaction. Section 4 defines a procurement transaction and directs the use of a procurement contract:

> "whenever the principal purpose of the instrument is the acquisition, by purchase, lease, or barter, of property or services for the direct benefit or use of the Federal Government."

and in Sections 5 and 6 defines an assistance transaction and directs the use of grants or cooperative agreements whenever:

> "the principal purpose of the relationship is the transfer of money, property, services, or anything of value to the State or local government or the recipient to accomplish a public purpose of support or stimulation authorized by Federal statute, rather than acquisition, by purchase, lease, or barter, of property or services for the direct benefit or use of the Federal Government."

Federal research and development involves both procurement and assistance and it is important to consider the type of transaction when we consider patent policy.

However, regardless of whether it is an assistance or procurement transaction, a patent, if one results from the effort, is a by-product -- something not contracted for nor specified to be accomplished as part of the grant activity -- an extra benefit.

Cost Sharing

The question of Federal funding also needs to be considered. For example, in assistance transactions supporting research activities, cost sharing by the recipient is required by Federal Management Circular (FMC) 73-3 which is still in effect. For other R & D

with State and local governments and the private sector; (B) the maintenance and strengthening of diversified scientific and technological capabilities in government, industry, and the universities, and the encouragement of independent initiatives based on such capabilities, together with elimination of needless barriers to scientific and technological innovation."

Section 102(c) states:

"(4) Federal patent policies should be developed, based on uniform principles which have as their objective the preservation of incentives for technological innovation and the application of procedures which will continue to assure the full use of beneficial technology to serve the public."

Acquisition Policy

Finally, as the last item of background is the Federal Acquisition Act of 1977 -- S. 1264 -- which has been reported out of the Governmental Affairs Committee. This Bill in Section 2(b) states:

"It is the policy of the United States that when acquiring property and services for the use of the Federal Government, the Government shall, whenever practicable rely on the private sector, and shall act so as to --"

"(2) maintain the independent character of private enterprise by substituting the incentives and constraints of effective competition for regulatory controls;

(3) encourage innovation and the application of new technology as a primary consideration by stating agency needs so that prospective suppliers will have maximum latitude to exercise independent business and technical judgments in offering a range of competing alternatives;

(4) maintain and expand the available Federal supply base by judicious acquisition practices designed to assure Government contracting with new and small business concerns to the maximum practicable extent."

continue the use of cost sharing in assistance and recoupment in procurement contracts. Perhaps we should also consider requiring royalty payments to the Government.

With respect to suppression of inventions, the Federal Government should have and use march-in rights if utilization of a patent is restrained. Fortunately, the competitors will help the Government monitor possible suppression and can help initiate the march-in process.

On the other hand, we must provide incentives to encourage disclosure of inventions so that patents will be filed. Suppression of disclosure must also be protected against.

PROCUREMENT

Let us examine, in procurement, how the commercialization goal can be met and how the question of allocation of rights might be answered. When the Government enters the commercial marketplace it either accepts normal commercial practices or, through regulations, it modifies the marketplace practices to the Government's end purposes. The enormous problems of regulations lead to the establishment by Congress of the Commission on Government Procurement. The Commission, which recommended and Congress then established the Office of Federal Procurement Policy, also recommended that a uniform patent policy be established which would replace the 19 statutes currently covering patents.

FEDERAL PATENT POLICY - IPAs

Dr. Baruch has described the efforts underway in the Executive Office of the President and among the executive agencies to make a determination on Federal patent policy. Within the context of these many considerations, we are still examining the final rule on IPAs in the Federal Procurement Regulations published in the Federal Register on February 2, 1978.

Mr. Chairman, if you or any members of the Subcommittee have recommendations regarding the rule, we would appreciate receiving them by July 18, 1978.

ANSWERS TO QUESTIONS

With respect to the questions contained in your letter of invitation of June 12, 1978, Mr. Chairman, HEW and NSF would be required to adopt the IPA in the FPR if it is released, and a comparable amendment is not planned for the Armed Services Procurement Regulation because DOD permits the universities to retain title without the use of an IPA.

Mr. Chairman that concludes my statement. It is evident that much work needs to be done before the question of Federal patent policy is resolved. You are to be commended for undertaking this study and holding hearings such as these. The record of these hearings should greatly facilitate the resolution on these questions.

I will be pleased to answer any questions. Thank you.

One of the other things we have coming along in the future which should help us identify the high technology small firms is the Federal Procurement Data System, a contract data bank, information for which will begin to be reported in October. The first output of information for the system should be available during the first quarter of 1979. We will be able to look at the trends for analysis and evaluation and possibly pinpoint areas for greater emphasis.

In summary, we have attempted to show the myriad of actions we have taken and have underway which add up to significant emphasis being given to small high technology firms. We feel that your hearings are constructive and certainly will give added emphasis to these firms. We will be moving forward with many of our initiatives. We appreciate your interest and would like to keep you informed of our actions and solicit your committee's support of our activities.

We would be glad to answer any questions that you may have.

Representative BRECKINRIDGE. Thank you very much for your testimony.

I have some questions which I want to have you enlarge upon at a later date which can be handled in writing. We will keep the record open for that.

Mr. DIETRICH. We will be glad to do that.

[The prepared statement of Mr. Fettig follows:]

THE TRENDS OF OFPP AND TRENDS IN GOVERNMENT BUSINESS

OFPP is a regulatory body constituted by the Congress under Public Law 93-400. We are as the Congress desired, an austere group, and rightfully so. We do not have all-inclusive authority regarding the conduct of research and development sponsored by the Federal Government. We do have the responsibility for the regulatory interface with industry as to how the Government conducts business. We have twenty professionals in the Office and a quite extensive list of active projects. As an example of the wide range of subjects, I have testified to Congressional Committees 13 times in the past 6 months, and not twice on the same subject. We have a myriad of regulatory and related initiatives that impact in varying degrees the relationship between small high technology businesses and the Government.

There are several more encompassing study activities that have segments addressing Federal procurement policies and R&D. For example, the Industrial Innovation Coordination Committee is conducting the Domestic Review on Industrial Innovations. I understand you will have the Science Advisor and the Under Secretary of Commerce appear to review this among other activities. Another domestic policy group is examining solar energy options for the President. This group will address Federal procurement policies that may provide leverage for obtaining or which are inhibiting achievement

ACTIONS TAKEN BY OFPP

When I joined OFPP as the Administrator, I found there were several projects on various aspects of small business (in general), minority business, and smaller R&D firms. These were individual efforts within the Office of Federal Procurement Policy. I felt it would be wise to integrate these efforts toward common objectives and eliminate some of the duplication and overlap which became obvious when each of these initiatives was reviewed in an overall context. To this end we have been working on a small business plan for several months. Although we are proceeding with some specific elements of the plan, the plan is linked into a White House Conference planned for next year. Early on, I recognized the necessity for special emphasis and appointed a special assistant as a focal point for Small and Minority Business matters. This was an effort to also ensure integration of the activities within the organization.

We have analyzed how innovative ideas are converted into viable commercial products that may both serve the public and fill Government needs. We found most of the problems can be addressed in three rather distinct phases of activity: 1) activities which involve innovative technology development and demonstration; 2) activities which involve production and acceptance of the new innovative product in the marketplace; and 3) activities which involve end-product

for a broad spectrum of small businesses -- high technology small businesses included.

With respect to all three phases, this Administration has increased emphasis on the use of minority businesses, which incidentally includes some small high technology businesses. It has been the President's desire to double or triple minority business participation as Government suppliers of goods and services. OFPP has taken a leading role in the program.

In the phase involving the development and demonstration of innovative technology, many actions have been taken. A-109 recognized that there is no segment, in or out of the Government, large or small, that has a corner on new and innovative ideas. So in A-109 we inserted the requirement that small businesses be given an opportunity; "... in order to achieve preferred system solution, emphasis will be placed on innovation and competition. To this end, participation of smaller and newer businesses should be encouraged...." This requirement had been implemented by the agencies, for example in the Department of Defense Directive 5000.1, "Competent industry and educational institutions regardless of size shall be the primary sources for the exploration of competitive system design concepts...." NASA and the Department of Energy have similar documents implementing A-109. We feel that if

interest. The Navy has been using this technique for several years to announce its areas of R&D emphasis to interest those with new and innovative ideas. We have an initiative to use basic agreements with contractors to simplify and accelerate the contractual coverage for subsequent contracts. It streamlines and simplifies the paperwork. We have also had an emphasis on the fast pay for performers, especially small performers who cannot financially afford to wait for long periods to be paid by the Government. Last but not least, small business has been exempted from the cost accounting standards. This too, should remove a significant barrier to participation of small high technology businesses as either Government prime contractors or subcontractors.

It has been stated through the years that small high technology firms are far more innovative than large firms. We felt that it was worth studying to develop such information regarding the derivation of innovations. We found in the study that was done, which was reviewed by an interagency panel, that the available information was subjective but confirmed that small firms are more innovative than large firms. Whether it was subjective or not, if innovation does occur, we want to sponsor it wherever it occurs. So we feel that removing the inhibitors to innovation by small high technology firms is certainly a reasonable and beneficial objective.

sector. We have had a first pass study to document the role of the laboratories in the Federal Government. We examined the laboratories' role involving support of major systems acquisitions, support of less than major systems, management of the base of science and technology related to agencies' missions and finally the support for ongoing operations. First, we must determine what must be done in these areas by Government personnel to have a viable work force. Then, we will develop the criteria for what is to be done by the Government and what is to be done by the private sector. We are now going into a second more extensive study of the role of laboratories and will then develop the necessary criteria.

Another important area to small high technology business particularly, and industry in general, involves patents and data rights. There is a study initiated by this Administration under the cognizance of the Science Advisor, assisted by the Department of Commerce, to address these issues.

Another initiative which we have been working with, and are in a position to acquire formal comments in the near future is a policy addressing the acquisition of research and development. By the way, our coordination procedures are quite extensive. An early draft of this particular policy has been circulated informally for comment to agencies,

Acquisition Regulation ready for publication by August, 1979. To augment the regulation, non-regulatory, explanatory manuals designed essentially for basic understanding of particular subjects will be issued. The need for a small business contracting manual is being examined.

FUTURE ACTIONS

With respect to the future, we plan to examine such things as the cost to a company submitting proposals to the Government in response to a solicitiation. For small high technology firms, we plan to look at the possibility of pre-qualification and then providing the up-front money for preparing proposals to the Government. The current practice requires them to either borrow or use their limited capital with no recourse for recovery after the contract is awarded. We may test this approach on a limited basis first to see what problems may arise.

We may also want to change the independent research and development and bid and proposal (IR&D/B&P) formulas for the small high technology firms, to give them more dollars rather than a percentage formula of past contract values as is now the case. For rapidly growing small high technology firms, we think the IR&D/B&P allowances should parallel growth.

added emphasis to these firms. We will be moving forward with many of our initiatives. We appreciate your interest and would like to keep you informed of our actions and solicit your Committee's support of our activities.

I think that is going to go on. My concern is this. I am looking for somebody on a white horse who is going to break a few spears and tell the President that this is where the action is.

We are grappling with two things this week, as you know. We are fighting the defense budget of $119 billion or $120 billion. We are fighting CETA, the public service jobs creation program. We are fighting, to me, without the necessary weapons.

The necessary weapons are the ingenuity and the expensive capacity and the development capability and the employment potential of "small business."

Each agency, which has an interest and/or responsibility in this area, can and will, until it finally gets beaten down, addresses its attention to that proposition with its own jurisdictional responsibility.

However, unless it finds understanding—and I do not say "sympathetic" unadvisably, but I say "sympathetic" because it is deserving—somewhere in OMB by someone that is capable of evaluating the various aspects of our economy and its relationship thereto, then this frustration will continue in this member's opinion.

That is my way of saying that I think the Office of Management and Budget has within its power and authority and responsibility the greatest opportunity to resolve the generally accepted twin evils of inflation and unemployment which are newcomers to the Western economy and which nobody has solved.

It is the greatest challenge and greatest opportunity that is around.

The other agencies cannot do it. They get lost in the cracks and crevices in between, like the Rabinow report, like it is better to spend than lend, like a variety of other proposals and programs that the record will disclose which are musting and mildewing somewhere.

I do not know whether this is something that is coming into focus or not. You are suggesting here that it is with reference to science and technology and innovative development. Of course, it reaches across the whole spectrum of our economy.

However, within that context, I would like to know what happened to Rabinow. I would like to know what happened, for instance, to "It Is Better To Lend Than To Spend." I would like to know what happened to the small non-Washington based, non-Washington representative segment of our economy which is the small business sector which is so tremendously productive and capable of producing such an employment explosion.

But it has clearly identified problems which the Government could ease. I am not talking about Government regulation. I am talking about deregulation studies and policies.

However, the gap that exists between the idealization that an earlier witness talked about and putting that on the line and reducing it to the market is a gap that has evolved somewhere during the time Henry Ford got going and today.

It is sometime between Teddy Roosevelt's grant to the Wright Brothers and today. The Government has always had, and will continue to have, a proper affirmative part to play in the supporting and strengthening of our economy.

You fellows sit on top of that heap because it all comes to you.

In that sort of a context, what happened to Rabinow? If there is criticism of it, I would like for you to tell me what it is. If there are

What affirmative action was taken? I do not like the phrase because of some circles and misunderstanding, but what affirmative action was taken?

Mr. DIETRICH. What was not done, which maybe should have been done, was to promulgate it and put it in the Federal Register which would have been the next step of saying: "Here is the report. Go to it."

First you must understand the coordination process that we must go through before any major regulations are promulgated.

When we draft a regulation, we send it for information coordination to all of the Government agencies and to some 35 industry associations, the General Accounting Office, congressional staffs, and so on, for informal comment. We will take those comments that come back on any policy, we revise the policy, and then send it out for formal comment. We send it again to some 96 Government agencies and 35 industry associations, and so on. We get that back and before it is made policy there are public hearings.

Representative BRECKINRIDGE. Let me clean up one piece of this. You and I did not have anything to do with it, but I want to get the record straight.

I have here Small Firms and Federal Research and Development, Report No. 2, Office of Federal Procurement. I have the March 10 memo incorporating that, a memorandum for certain OFPP contact points and small technology firms.

We are talking about the same thing?

Mr. DIETRICH. Yes; that is the one that was sent to the 10 agencies.

Representative BRECKINRIDGE. That was from Mr. Trimble. He signed it and the agencies are attached.

Then I have a March 7 item.

Let me try to get the record sorted out. I have too many papers here, obviously. They are all dated March 10.

The paper I have reference to is a memorandum for heads of executive branch departments and agencies. The subject is: "Increased Use of Small Technology Based Firms." It includes and incorporates that report.

In the last sentence it says: "It is important that we see some real progress within the 18 months of this administration. Thank you for your assistance in the important matter."

It is unsigned and undelivered—and until you correct me—and, therefore, unimplemented—unless you correct me and tell me how it has been implemented—within the intervening 14 months of March, April, May, June, July, which would be 17 or 18 months.

Mr. DIETRICH. This was a memorandum that was sent to all the addressees by the March 10 memorandum asking for their comments as to whether this would be an acceptable memorandum if the Director of OMB signed and sent this to the head of their agency.

That was never done. In other words, we went out and asked for the comments.

Representative BRECKINRIDGE. You have given me a reverse process. I am familiar with all the correspondence that comes up here on the Hill that says: "This has been reviewed by the Office of Management and Budget. It is all right to send it to you."

This is the first time I have ever heard of you asking them if it was all right to send it. Is that a new technique that has been developed?

of Defense to divide large research and technology programs into numerous discrete parts in order to permit more awards to small R&D firms. I believe, however, that this can be offset by concentrating more on recommendation 3, especially the motivation of prime contractors to subcontract more R&D work to small firms.

Please let me know if you need additional information from the Department of Defense.

Sincerely,

GEORGE W. SUTHERLAND,
Assistant Director (Systems Acquisition Management).

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE,
OFFICE OF THE SECRETARY,
Washington, D.C., March 28, 1977.

MR. ROBERT F. TRIMBLE,
Assistant Administrator for Contract Administration,
Executive Office of the President,
Office of Management and Budget, Washington, D.C.

DEAR MR. TRIMBLE: Thank you for affording us an opportunity to comment on the proposed memorandum transmitting the report and recommendations on the increased use of small firms in Federal research and development work.

We have no suggestions on the proposed memorandum.

Sincerely yours,

PAUL A. STONE,
Deputy Assistant Secretary
for Grants and Procurement Management.

U.S. DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SECRETARY,
Washington, D.C., April 1, 1977.

MR. ROBERT F. TRIMBLE,
Assistant Administrator for Contract Administration,
Office of Federal Procurement Policy,
Office of Management and Budget, Washington, D.C.

DEAR BOB: In reply to your memorandum of March 10, 1977, we hereby submit our views and comments on the report and proposed recommendations of the interagency panel on increased use of small technology based firms.

We appreciate the opportunity to respond to this proposed action.

Sincerely yours,

JAMES E. JOHNSON,
Chief, Procurement and Grants,
Office of Administrative and Management Policy.

Enclosure.

COMMENTS ON "INCREASED USE OF SMALL TECHNOLOGY BASED FIRMS" MEMORANDUM

1. We believe a more appropriate title for the proposed memorandum would be "Increased Use of Small Business Firms in Federal Research and Development Procurment", since the phase "small technology based firm" could cause confusion.

2. The proposed memorandum to the heads of executive agencies and departments which transmits the interagency panel report does not appear to be an effective mechanism for increasing small business R&D awards. You may recall that the Commission on Government Procurement found that the lack of guidance on R&D procurement in the Federal Procurement Regulations (FPR) resulted in the promulgation of diverse and inconsistent R&D procurement regulations by individual agencies. These regulations continue to baffle potential R&D performers, particularly those which are small business concerns. As you are aware, the House Committee on Small Business in House Report No. 94–1749, recommended that OFPP continue to engage in all appropriate efforts to simplify, clarify, and make uniform all Federal procurement regulations in order to lessen the amount of paperwork associated with government contracting and to insure

regard to the sponsorship and/or use of federally funded research and development centers.

8. If recommeudation 8 is to be considered on a uniform basis by all agencies, appropriate changes will be necessary in ASPR 15–205.3 and 15–205–35 as well as FPR 1–15.205–3 and 1–15.205–35. Additional guidelines are necessary if this recommendation is to be implemented in a uniform manner, and such guidance should be included in government-wide IR+D/B+P policy now under consideration within OFPP.

9. We believe recommendation 9 should state more specifically the information to be collected, to whom it is to be reported, and the use of be made of it. The OFPP should consider this recommendation in establishing its Federal Procurement Data System.

10. We note that House Report 94–1749 recommended that OFPP instruct all agencies that every procurement requirement is presumed to be suitable for award to a small business unless the agency can document compelling reasons why awards must be made to other than small business firms. By memorandum to heads of executive agencies dated November 29, 1976, OFPP stated this policy. However, since this policy is not contained in either the ASPR or the FPR, we believe the lack of uniformity in agency implementation will give rise to increased burdens on potential small business firms. Therefore, we are recommending that the primary procurement regulations be amended to state this policy since it may directly affect the use of small R. & D. firms. We would also caution against the issuance of procurement policy statements by OFPP which are not codified in the regulatory system.

OFFICE OF THE SECRETARY OF TRANSPORTATION,
Washington, D.C., April 21, 1977.

MR. ROBERT F. TRIMBLE,
Assistant Administrator for Contract Administration,
Office of Federal Procurement Policy,
Office of Management and Budget, Washington, D.C.

DEAR MR. TRIMBLE: This is in response to your request for comments on a proposed OFPP policy memorandum which would require agencies to undertake a special program to increase the share of research and development dollars and awards which go to small technology based firms.

I agree that the establishment of a special program to increase the awards to small technology based firms might be appropriate in some agencies. However, I do not believe any special program should be mandatory on agencies like DOT where awards to small business firms in R&D are significantly higher than the Government average cited by the Ad Hoc Interagency Panel.

The Department of Transportation and its component operating administrations continue to make special efforts to insure that information on DOT research and development programs is disseminated to all of industry. For example on May 24, 1977, during Small Business Week, the Transportation Systems Center is sponsoring a conference "Transportation Research and Development—a Briefing for Industry." Invitations have been sent to many minority owned and small business firms. This conference is designed to familiarize industry with anticipated R&D-related contracting opportunities within the Department. A copy of the brochure describing this conference is enclosed for your information.

Sincerely,

BARNETT M. ANCELEITZ,
Director of Installations and Logistics.

U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION,
Washington, D.C., March 30, 1977.

MR. ROBERT F. TRIMBLE,
Assistant Administrator for Contract Administration,
Office of Federal Procurement Policy,
New Executive Office Building, Washington, D.C.

DEAR MR. TRIMBLE: We have received your memorandum of March 10, 1977. Subject: "Increased Use of Small Technology Based Firms" with the attached

Thank you for your efforts on behalf of the small technology based firms, and we look forward to a positive impact by the issuance of the memorandum.

Sincerely,

R. F. McDERMOTT,
Director, Office of Procurement and Technical Assistance.

Representative BRECKINRIDGE. I think we have the record straight on that point.

Now, having been advised by an agency or agencies that they do not like the benefit of this advice and they are not interested in implementing it, could I ask what the next step is? Or is that the end of it?

Mr. DIETRICH. Normally it would be to go ahead and implement it. This is what I said earlier. It was decided by Mr. Fettig to have even greater emphasis put on it by integrating it within an overall plan for small business that would be sponsored by the President through the White House.

Representative BRECKINRIDGE. This is for the record. It transpired before Mr. Fettig took office; am I correct? This went out before it became his responsibility; right?

Mr. DIETRICH. That is right.

Representative BRECKINRIDGE. He came in and found this report and found it unimplemented and found whatever objections there were of record, which you are going to make available for this record.

Then he decided it was so important that he put it in the larger context of a White House Conference for Small Business?

Mr. DIETRICH. Right.

Representative BRECKINRIDGE. That is great, except it is 18 months past and another 18 months. That is 36 months. That is like the life of this administration. The survival time for an awful lot of small businesses is there.

Is there any contemplation of moving this up and moving it forward?

Let me try to enlarge this. I hope we are trying to do the same thing here.

If I had gotten a memorandum back, or if you had gotten it back, from 5 out of 15 agencies saying negative, then I think we would have done something about that negative attitude, and we would have reduced it to an agreed directive or we would have ordered it.

What in the world has happened since that date to this, and what is going to happen in terms of the implementation and/or the adjustment of this very important piece of work that Mr. Fettig agrees is important?

We do not want to wait for another 18 months. That should have happened 18 months ago. You and I should really be sitting on top of this now and working from this.

Mr. DIETRICH. It was not directed. Maybe it would have been better had it been directed.

We had been working the individual pieces and recommendations within that. We have not held any of them up. We have not held any of the agencies up who chose to implement it.

But you are right. We did not give that firm, positive direction.

Representative BRECKINRIDGE. That is all right. That is the kind of thing that happens when we have turnover in personnel and managerial moves.

All of our data shows that the first 1,000 major corporations created .06 percent of the new jobs between 1969 and 1976, and that employment in the small innovative technology firm sector grows at the rate of 40 percent per annum.

Yes, it is small, but it multiplies.

Additionally, the scientists and the engineers working for the small entrepreneur costs half as much out as those in the large sector; small business also generate half of the total new technology and development, and is 2.6—as the witness said before you came on this morning—times cost effective.

We get so involved in half-trillion dollar budgets that we forget where the goose is. I am just hoping that the Office of Management and Budget, and particularly your office, which is on this so-called "keen cutting edge of American leadership" which is disappearing—and it is disappearing—will take the lead and the initiative within that massive organization to focus and bring to bear at the Presidential level at the earliest possible date—not at the White House conference down the way—this sort of intelligence and understanding now.

This committee and this Congress then can begin to support you in those activities and efforts.

I am not talking about throwing money up against the wall. I am talking about generating revenue receipts and creating new jobs in an open and competitive society. I am talking about new entries, new openings, new opportunities, and new hopes.

This is where it starts. That is what my questions are directed at.

Mr. DIETRICH. I do not think we have any difference of opinion at all as to the importance and the long-range revenue generation by small and innovative high technology businesses. I think the point is well taken. We certainly are not disagreeing with that. I am sure Mr. Fettig does not disagree either.

Representative BRECKINRIDGE. This is another one of our problems. We all agree when we sit around the table; then we all go back and the other pressures divert our attention. There are some points that we have to hold our attention on. You happen to be sitting in one of those offices in this member's view. I am delighted with your interest and your intention to proceed.

However, I would like to see it formalized to the extent that we can.

Between now and the White House conference, what happens in your area? I think it would be helpful if the Office took an across-the-board spectrum look at the economy in terms of what happens now and the Conference on Small Business.

I can tell you what they will tell you when they get there. Come read the record. You do not have to have a conference. It is all right. I am all for it. I believe in it. I would like to participate.

However, we know what it is. It is in the area that we are talking about. The question is: How do you focus bureaucratic attention? That includes the Congress. We are all locked up in the same processes.

How do you focus attention and implement it and move it?

law, it will be a strong mechanism in aiding us to do the job that we want and need to do.

Representative BRECKINRIDGE. I want to thank you for that. Let me say simply that we are in the process of preparing, in addition to our report, our conclusions and recommendations. Such recommendations as this and others that may be brought forward at a later date, will be brought forth. We will receive that sort of active consideration.

If it does make sense to you, then we would ask that the record not only be kept open, but perhaps we could have Mr. Fettig come forward in a couple of months and review what we have discussed and what ideas you have come up with with a simple objective of trying to find out how we can be helpful. It is an area of common interest.

One of the previous witnesses, the NSF, has received an award for an outstanding program that it has in stimulating research and development in the small business community. I am tremendously impressed by the quality of their program and the soundness of the foundation upon which it has been erected.

It does make this suggestion. I followed your testimony. I will not call it the "trickle-down" theory, but the subcontractor does get in on some R. & D. by virtue of the fact that the majors cannot do it and the minors can do it. They get what is there.

However, I think they indicated that had it not been for congressional mandating of the amount of money for that purpose, undoubtedly that program would not have gotten off the ground. Then they would not have had the successful growth experience that they have had.

If you do not want to address this now, you can address this later, but would it occur to you that a similar provision in other major procurement programs with a set-aside percentage might be helpful? It might be a modest set-aside as a trial and error thing. Would this be useful?

I think the data before us is this. Although you have given us some 16 percent, 17 percent, 18 percent figures, and one 20 percent figure, the average U.S. Federal R. & D. investment in small business is about 3.5 percent. Its procurement dollar is about 26 percent. I am not suggesting closing that gap. I am raising the question.

Is the NSF so different that it would not work elsewhere?

Mr. DIETRICH. Let me say first that we would be glad to answer that for the record.

Representative BRECKINRIDGE. Without objection, so ordered.

[Subsequent information was received and follows:]

The NSF requirement is that 12½ percent of the agency's funds available (approximately $54 million, fiscal year 1978) for applied research go to small business. We do not believe that a similar requirement placed on the procuring agencies would be appropriate. NSF does not, as do DOD, NASA, DOE, etc., procure end items or products to fill a specific need. Further, its funds for applied research are expanded in most instances, through grants rather than contractual documents. Accordingly, we feel that a quota for small business such as the one legislatively imposed on NSF would be inappropriate.

Mr. DIETRICH. I will give you my personal opinion at this time.

My personal opinion is this: I think that we would like to use goals rather than using quotas. Quotas can get us into trouble in compromising competition and in not being able to really do the end objective

Let me take a moment, if I may, and look it over.

Let me say that it is consonant with what we have been saying. It grows out of yesterday's hearings over on the Senate side. It does contain what I would consider some very modest recommendations and suggestions. I think I will sign it and go on record as being for you guys. We are all doing the same thing.

This will come along in today's mail. I will address that later.

Mr. DIETRICH. Would you like me to take it with me? [Laughter.]

Representative BRECKINRIDGE. Mr. Glover, do you have any questions?

Mr. GLOVER. No questions.

Representative BRECKINRIDGE. Gentlemen, we want to thank you very much. We will keep the record open. We will look for an opportunity to have the benefit of your advice in those areas where we think we can be of assistance to you in the furthering and developing of your program.

We will look forward, unless something intervenes or anything that is unforeseen at this time, to seeing and/or hearing from Mr. Fittig at a later date. Tell him how sorry we are he could not make it today, but we understand.

Thank you very much for being here.

Our next witness is Admiral Leroy E. Hopkins, Associate Director of Procurement for NASA.

I want to thank you, Admiral, for foregoing your place on the schedule this morning and letting our friend from OMB precede you. That is very considerate of you.

We are delighted to have you and your associates with us.

Please proceed.

STATEMENT OF ADM. LEROY E. HOPKINS, ASSOCIATE DIRECTOR OF PROCUREMENT, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, ACCOMPANIED BY LOUIS MOGAVERO, CHIEF, TECHNOLOGY UTILIZATION; FLOYD I. ROBERSON, DIRECTOR, TECHNOLOGY TRANSFER; AND KENNETH KIER, DIRECTOR, SMALL AND MINORITY BUSINESS OFFICE, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Admiral HOPKINS. Thank you, Mr. Chairman.

Representative BRECKINRIDGE. Would you introduce, for the record, your panel?

Admiral HOPKINS. Yes; my associates are Mr. Floyd Roberson, Director, Technology Transfer, Mr. Louis Mogavero, Chief, Technology Utilization, and Mr. Kenneth Kier, Director, Small and Minority Business Office.

Representative BRECKINRIDGE. Before you start, may I let somebody at this table correct a recollection I have of a number of years ago?

At one time I was Chairman of the so-called Southern Interstate Nuclear Board, which operated, as it name implies, throughout the 17 Southern States. We were on some sort of a mission. We went to one of your facilities. It was Lake—it is where Higgins Boat Company is.

Admiral HOPKINS. The NASA Michaud.

1.702 General Policies.

(a) It is the policy of NASA to place a fair proportion of its total purchases and contracts for supplies and services with small business concerns, and to afford small business concerns an equitable opportunity to compete for contract awards. In the area of research and development contracts, it is NASA policy to award such contracts to those organizations 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 is in the national interest that the number of firms engaged in research and development work for NASA be expanded and that there be an increase in the extent of participation in such work by competent small business firms.

(b) Each NASA installation having procurement authority shall implement this policy by:

(i) searching continually for and developing information on sources (especially small business concerns) competent to perform research and development. Advance publicity, including use of the Commerce Business Daily (see 1.1003-5) to the fullest extent practicable, shall be given for this purpose. The search should include a review of relevant data or brochures furnished by sources seeking research and development work and a cooperative effort by technical personnel, small business specialists, and contracting officers to obtain information and recommendations with respect to potential sources by publication of proposed procurements, in addition to the synopsis requirement.

(ii) encouraging contracting officers, technical personnel, and small business specialists to cooperatively seek and develop information on the technical competence of small business concerns for research and development contracts. Small business specialists shall regularly bring to the attention of contracting officers, and technical personnel descriptive data, brochures, and other information as to small business concerns that are apparently competent to perform research or development work in fields in which the installation is interested.

(iii) maintaining bidders lists on a current basis and reviewing them to ensure that all small business firms who have made acceptable application to NASA or who appear from other information (including recommendation by the SBA) to be qualified are included therein;

(iv) acquiring descriptive data, brochures, or other information concerning small business firms who appear competent to perform research and development work in fields in which NASA is interested and furnish such information to technical personnel;

(v) to the extent feasible-

(A) dividing procurements of supplies and services into reasonably small lots of not less than economic production runs in order to permit bidding on quantities less than the total requirements;

(B) allowing the maximum amount of time practicable for preparation and submission of bids and proposals; and

(C) establishing delivery schedules suitable for small business participation.

(vi) providing to authorized SBA representatives, upon request, information necessary to understand NASA needs concerning research and development programs under consideration for specific future procurement actions. The SBA may provide pertinent information concerning potential small business sources developed through its investigation of the capabilities of specific firms in the particular field of research and development covered by the programs. Full evaluation shall be given to any such information in selecting qualified sources;

(vii) disseminating widely information relating to NASA purchasing methods and practices; and

(viii) freely interchanging ideas and information, including statistical data, with appropriate SBA levels, relating to programs for limiting suitable procurements to small business concerns; and making maximum use of the capacity of small firms in such programs in order to accomplish the purpose of this policy. As to subcontracting, see 1.707.

(c) Records of the total value of all contracts placed with small business concerns during each fiscal year, and reports based thereon, are maintained by NASA through its agency-wide procurement reporting system described in 16.901.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION—SMALL BUSINESS PROGRAM PRIME CONTRACT AWARDS

[Dollar amounts in thousands]

Appropriation category	Total	Research and development	Research and program management	Construction of facilities
Fiscal year 1978 (9 mo):				
Total NASA business	$2,315,864	$2,128,488	$97,657	$89,719
Small business	201,227	130,168	27,818	43,241
Percent of total business	(8.7)	(6.1)	(28.5)	(48.2)
Set-asides	64,851	33,267	10,367	21,217
Percent of total business	(2.8)	(1.6)	(10.6)	(23.6)
Percent of small business	(32.2)	(25.6)	(37.3)	(49.1)
Fiscal year 1977:				
Total NASA business	2,838,117	2,588,937	128,913	120,267
Small business	254,961	169,914	38,470	46,577
Percent of total business	(9.0)	(6.6)	(29.8)	(38.7)
Set-asides	83,702	39,759	14,696	29,247
Percent of total business	(2.9)	(1.5)	(11.4)	(24.3)
Percent of small business	(32.8)	(23.4)	(38.2)	(62.8)
Fiscal year 1976:				
Total NASA business	2,536,101	2,333,598	118,548	83,955
Small business	218,325	150,363	35,700	32,262
Percent of total business	(8.6)	(6.4)	(30.1)	(38.4)
Set-asides	66,757	34,452	13,343	18,962
Percent of total business	(2.6)	(1.5)	(11.3)	(22.6)
Percent of small business	(30.6)	(22.9)	(37.4)	(58.8)

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

Admiral HOPKINS. The R. & D. category includes, in addition to basic and applied research and development, those procurements for equipment, materials, and technical services which directly support the R. & D. effort. In fiscal year 1977, awards to small business in the R. & D. category exceeded those in fiscal year 1976 by $19.5 million. While the statistics for the first three quarters of fiscal year 1978 are running slightly behind, the final quarter of a fiscal year is typically favorable in terms of awards to small business. Therefore, we are optimistic that the final results for fiscal year 1978 will exceed those for fiscal year 1977 in all budget categories.

Representative BRECKINRIDGE. Could I interrupt at that point?

I think it would sort of expedite things if, instead of waiting for a list of questions, I might take them up as they come along.

I had been advised that his year's awards were as you confirmed, but could you tell the committee why, if you know why, they were off during the first three quarters?

Admiral HOPKINS. They are not off very much, but generally what you have to examine is the nature of the procurements that are ongoing and their susceptibility to small business awards.

Thus, I think the emphasis that has been placed on small business awards generally tends to foster and improve conditions later on in the year.

Obviously, we in management become concerned when we see a poor trend in our statistics, and therefore we try to place additional emphasis on our installations to achieve their goals.

committee and subcommittees and is not attached so as not to burden the record. This publication, with an annual distribution of 3,000 copies, contains an abstract of each funded research and technology task in progress, by the NASA installation of primary interest. It further identifies the principal NASA investigator and encourages personal contact of a professional nature. The manual receives extensive distribution to small research firms, and we firmly believe it to be extremely important to them in acertaining their specific interests in doing business with NASA. The annual issuance of the RTOP summary is announced in the Commerce Business Daily.

As for unsolicited proposals, it is longstanding NASA policy to encourage the participation of small research firms in its work through the medium of the unsolicited proposal. We fully recognize the creativity and special abilities that reside in small R. & D. firms in the conception of relevant new ideas, new product development, and in problem resolution. Your attention is now invited to the new research contract awards resulting from unsolicited proposals, which indicates that small firms are receiving about 25 percent of the number of such awards.

I would like to ask that this be inserted in the record at this point.

Representative BRECKINRIDGE. Without objection, so ordered.

[Material follows:]

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

	Number of awards	Percent of number	Amount	Percent of amount
Fiscal year 1978 (9 mo):				
Total awards	105	100	$9,060,357	100
Large business	37	35	2,275,013	25
Small business	26	25	4,223,662	47
Universities	29	28	1,847,307	20
Nonprofit	13	12	714,375	8
Fiscal year 1977:				
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
Fiscal year 1976:				
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

Note: Excludes grants, intragovernmental, cooperative agreements.

Admiral HOPKINS. It is significant that for the year to date small firms have received $4.2 million in research contract awards, or 47 percent of the total dollars involved. This is a substantial increase over the amount of comparable awards in fiscal year 1976 and fiscal year 1977.

I turn now to cost sharing.

In further support of its efforts to insure the participation of small business in its research and development activities, NASA continues its liberal cost-sharing policy for basic and applied research. Each year since fiscal year 1970, NASA's appropriation acts have imposed a cost-sharing requirement on all grants and research contracts resulting from unsolicited proposals. However, in interpreting congressional

the research and devleopment necessary to remain competitive if it were not for their access to the vast amount of technical information available through NASA industrial application centers. In one case, Kenics adapted NASA heat pipe technology provided by the NASA IAC at the University of Connecticut to a device used in the cooling of an injection molding process to produce thermoplastic products. The device, known as a hot sprue bushing, is used in the mold to eliminate the wasted plastic associated with each molded product. Without the heat pipe sprue bushing, wasted plastic in the mold passage ways sometimes equals the amount of plastic in the mold itself. Keeping the mold passageways hot, using heat pipe technology, eliminates waste materials, thus providing enormous savings to plastics manufacturers. Furthermore, Kenics feels that this injection mold product is just the first of a family of products utilizing heat pipe technology that they will introduce to the plastics industry and possibly to other marketplaces.

In September 1975 NASA and the SBA entered into a cooperative agreement to provide technical assistance to small business on a test, no-fee basis, through the IAC in Los Angeles, to further promote the utility of the IAC's in resolving small business problems. In its initial year of service, more than 200 small firms took advantage of the opportunity, with estimated benefits to them valued at about $1 million. This joint effort was subsequently extended, in 1977, to serve the northeastern small business community through the IAC located at the University of Connecticut, with similar favorable results. A similar program is being considered to service the Dallas-Fort Worth area through the NASA IAC in Durant, Okla.

A related NASA activity of technology utilization, with well-defined benefits for small business, is the patent licensing program. Over the years, more than 400 licenses have been granted to practice NASA investigations, most of which have been awarded to small business firms.

I might add here, Mr. Chairman, that NASA does grant exclusive licenses, as well.

New produce developments under these licenses include solar energy devices, medical instruments, industrial production aids, and other products and processes.

In one example, NASA recently granted a patent license to a small minority firm, Hopkins International Co., to manufacture a hearing aid malfunction detection unit—HAMDU—which is a miniaturized, battery-powered system which monitors hearing aid malfunctions. Hearing aids often develop malfunctions that are not detectable by the wearer. This is particularly true when the wearers are school-age children. Studies of selected groups showed that 30 to 50 percent of schoolchildren were not getting adequate benefits from their hearing aids due to unrecognized malfunctions. Based on microcircuit technology, NASA built prototype units of HAMDU as part of its technology utilization program. The units were thoroughly tested in the laboratory and in actual use by schoolchildren. Hopkins International plans early commercial availability of its version of the device.

NASA will continue its efforts to make the small business community aware of the technology that is available and to find improved methods of delivering this technical information to the small businessman. We believe that the dissemination of new technology and the

then the small manufacturer and the small business firm is really not the place to get the job done.

That was the generality.

Admiral HOPKINS. I believe while there will be changes in the nature of NASA's business, it is essentially program-oriented over a period of time, I do not think that these necessarily have to work to the detriment of small business.

I think what it requires is a more intensive effort on our part in identifying opportunities for small business in these programs. Therefore, small business should be able to participate, even though there may be limitations in certain programs simply by virtue of the nature of the hardware being procured.

Representative BRECKINRIDGE. Let me ask you about another part of your program which catches my attention for a different reason.

We have been getting a lot of testimony on the job creation potential of small business and on the credit crunch, which is being experienced as a lack of cash available, either on account of the commerical banks or the marketing system. Nobody is interested in buying stocks and bonds and the shares of small firms.

Half of them cannot get to the door, let alone pass the idealization we were talking about earlier this morning. This is a lack of capital that is necessary for them to reach the point where research and development can bring them to a testing point.

If I understand the record correctly, throughout the years in the history of NASA, you have had only two minority business failures during the course of your contractural experience with small minority business enterprises.

Am I stating the fact?

Admiral HOPKINS. I believe that is correct. I will check with Mr. Kier. I believe that is correct.

Representative BRECKINRIDGE. Then you have something else to teach the nation. That record has not been the record elsewhere. It has been much less favorable. In fact, it perhaps has been sufficiently unfavorable to prejudice the interests and the rights of the minority entrepreneur. This is highly undesirable. That is an unhappy side of the situation.

To what do you attribute your success and their success in this joint effort? Have you had a sizable experience with minority business firms?

Admiral HOPKINS. Yes, I have. While I was in the Navy on active duty, I let the first 8(a) contract that the Navy awarded.

If I may interject my personal opinion, I believe the success of the program is almost directly proportional to the amount of involvement that the Government is willing to participate in with the contractor in helping him establish business practices that will enable him to be successful.

It is necessary to work with him in obtaining financing, in helping him as best we can in setting up production lines, if those are involved, in setting up control methods, and, in fact, getting his business off the ground.

If the Government is willing to invest those sorts of resources to minority contractors then typically he can be successful in producing the product and service that we want to buy.

Administration, which works with you, I am sure. The idea is to see that the small business community is maximized in this effort.

There is a segment, of course, within that segment. I would say you have the national record.

Admiral HOPKINS. Thank you, Mr. Chairman. We will try to furnish for the record a summary of our procedures in dealing with minority contractors. I doubt very much that there is any magic panacea of formula we have developed. I think it primarily is the result of our hard work and the dedication of our people. We we will also continue to work with the Small Business Administration in this same area.

Representative BRECKINRIDGE. Thank you.

Without objection, so ordered.

[Material to be supplied follows:]

for our small and minority business specialists, our contracting officers, and requirements personnel to spend sufficient time in the preaward phase with the contractor in achieving this objective.

In the post award phase, similar attention is given to ensuring satisfactory contract performance. NASA management acknowledges its joint responsibility with the SBA in the business development of small minority firms. Therefore, every effort is made to monitor contract performance, anticipate problem areas, and assist as may be necessary. Problems beyond our capability to resolve are promptly referred to the SBA for management and financial assistance, as appropriate.

We do not believe that we have a special panacea which guarantees the survival and development of small business. Whatever success we may have achieved is attributed to our selection process which limits our work to performance by firms with good potential, and our willingness to work closely with such contractors to ensure acceptable performance.

what I have heard is that that could be done in all agencies much more than it has been done.

Could you comment on that?

Admiral HOPKINS. Yes, sir.

I think that is exactly right. There is a need for an intensive review of the possibilities or potentialities of small business. We need to do exactly that. This happens to be a ripe area, if you will.

Mr. GLOVER. I have one additional area.

We notice that the goals for small business research and development have remained around 6.6 percent. I was wondering whether you are going to increase those goals in the future and whether there is going to be a higher amount in the forthcoming years.

Admiral HOPKINS. Yes, sir. I think they probably will be.

As I indicated in my testimony, we are currently conducting a very intensive in-house review of how we deal with small business, particularly small business research and development firms.

We have a number of initiatives in mind.

At the present time, we are conducting a fairly detailed analysis of the potential for small business, particularly small business with research and development capabilities to see how we might possibly set goals. I am sure they would result in overall increases in our goal in terms of awards to small business firms.

Mr. GLOVER. Thank you.

Thank you, Mr. Chairman.

Representative BRECKINRIDGE. Gentlemen, let me thank you very much for being here.

You have patiently been sitting through some of the other testimony. You have an obvious feeling for the problems that we are interested in and are concerned about. You have one of the effective programs which you are going to enlarge the record with.

If you have anything else to add to the record which you feel will contribute to the committees' objectives and goals, I hope you will feel free to let us have the benefit of your experience and your advice.

Having said that, I want to thank you again.

Our next witness is Mr. Matthias Lasker, Acting Deputy Assistant Secretary for Grants and Procurement, Department of Health, Education, and Welfare.

We are delighted, Mr. Lasker, to have you and your associates with us.

Would you mind introducing them for the record?

STATEMENT OF MATTHIAS LASKER, ACTING DEPUTY ASSISTANT SECRETARY FOR GRANTS AND PROCUREMENT, U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, ACCOMPANIED BY JOSEPH L. GRAY, SMALL BUSINESS SPECIALIST, NATIONAL INSTITUTES OF HEALTH; AND WILLIE E. BOYD, ACTING DIRECTOR, DIVISION OF SMALL AND MINORITY BUSINESS ASSISTANCE, U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Mr. LASKER. Thank you, Mr. Chairman.

To my right, is Mr. Willie Boyd. He is the Acting Director of the Division of Small and Minority Business Assistance, Office of the

Secretary. To my left is Mr. Joseph Gray, the small business advisor for the National Institutes of Health.

Representative BRECKINRIDGE. We are delighted to have you gentlemen in light of that colloquy that took place between the Admiral and me earlier with reference to two failures. I do not know whether he has to spinoff.

I have been listening to the story of NASA's technological spinoff for a long, long time. I would like to see that one spinoff because he has got to have something there that all of our agencies need. It is a know-how that applies talents that are available to us. They get the end result we are all after.

I would hope that you and he could get together and make something real out of this on an interagency basis. That is a remarkable record.

I should have asked him this. I wonder how many other small firms he had go bankrupt in the contractual experience. It would have exceeded two by a large number. That is the nature of our competitive system. I think that is something.

I would welcome a further explanation of that. You, of course, are one of the major agencies in Government.

Mr. LASKER. As an aside, Mr. Chairman, let me say this. HEW, of course, is very heavily involved in the provision of assistance with the mechanism of grants. It is considerably less involved in the procurement of services or R. & D. through the mechanism of contracts.

It has been one of our practices in our grant program for many, many years to provide technical assistance to grantees of all types, many of whom are minority organizations, to assist them in their business management competence and their ability to carry out their projects.

We feel that is one of our basic responsibilities.

Representative BRECKINRIDGE. You may proceed.

Mr. LASKER. Mr. Chairman, I appreciate the opportunity to appear before you today to discuss the Department of Health, Education, and Welfare's efforts in promoting assistance to small business concerns. This assitance by HEW enable small businesses to undertake and to obtain the benefits of research and development.

With me today is Mr. Willie E. Boyd, Acting Director, Division of Small and Minority Business Assistance, Office of the Secretary, and Mr. Joe Gray, Small Business Advisor, National Institutes of Health.

Let me begin by giving some background information about the HEW small business programs. The total budget for the Department is well publicized, amounting to in excess of $180 billion.

Less well known, however, and of significant interest to the small business person seeking to do business with the Department is the fact that HEW annual procurement awards amount to $1.5 billion. Because of the nature of the DHEW mission, 49 percent of these contracts are made to nonprofit organizations—State and local governments, hospitals, colleges, universities, medical schools, and others.

I might also mention that of that $1.5 billion in contracts, close to 21 percent is awarded to small businesess.

Of the $1.5 billion in contracts, research and development contracts account for approximately $477 million. Research and development awards to small business amount to approximately $17.3 million.

R. & D. services are most likely to be procured by the following HEW components:

Representative BRECKINRIDGE. There has to be something unique here; if you have had sizable participation, across-the-board representation then these 2 out of 10 they would be significant. If there were 2 out of 20 it would be incredible, and if it were 2 out of 50 it would far exceed the experience of everybody going into business and not going bankrupt in the first 5 years; that is a record in and of itself.

So what you are saying is really unique. I would like to have that said far and wide. This is one of our problems. The right and left hands do not know what they are doing and they do not communicate. We do not transfer our know-how.

You have a know-how here that I think is tremendously important to the economy, to that particular segment of it.

Mr. Glover, do you have any questions?

Mr. GLOVER. Yes, Mr. Chairman.

In attachment 2 you refer to industry subcontract awards. Would you identify what that class of awards is?

Admiral HOPKINS. These are the subcontract awards of our major prime contractors.

Mr. GLOVER. Do you establish the portions of those contracts that you are going to allow subcontracts on, or is that totally at the discretion of the prime contractor?

Admiral HOPKINS. No. sir. We have participated in that when we have utilized funds for R. & P.M. or cost of facilities. We consider the prime contractor small business subcontracting program as an evaluation criteria in making the decision on which proposals to accept under our major contracts.

Therefore, while the percentage or goals may change with the individual procurements, nevertheless, we review that prime contractor or subcontracting program and evaluate it. It becomes part of the item of negotiation before the final contract is signed.

Mr. GLOVER. Is one of the factors that you take into consideration whether the prime contractor is keeping all of the research function to himself or whether they are letting some of that more profitable area also be subcontracted?

Admiral HOPKINS. To the best of my knowledge, it is not a prime consideration in that process.

Mr. GLOVER. One of the things that small businessmen have raised to us concerns looking too strongly at subcontracting as opposed to prime contracting of research. Quite often they say that the prime contractor takes all the profitable good portions of the research even though the small firm could do those and do them well. The small business firm then gets the less profitable, more menial types of research.

I wonder if there is any way at NASA that you have to make sure that does not happen?

Admiral HOPKINS. We would be pleased to look into the possibility of including that as one of the factors when we evaluate the prime subcontracting program. Perhaps it may be incorporated into our procedures then.

Mr. GLOVER. One of the other things that will go into that is that occasionally you can find a situation where you could break out that contracting even for the major prime contractor and still award it to two small businesses in specific areas if you have identifiable segments.

I believe you addressed yourself to that generally, but knowing

Since inception of NASA's Minority Business Enterprise Program in the latter part of FY-1970, the agency has awarded 858 individual contracts valued in excess of $138 million to small minority firms, either directly or through Section 8(a) procedures through the Small Business Administration (SBA). In addition, minority firms have also received approximately $93 million in subcontract awards. A summary chart of these awards is as follows.

Minority Business Procurement Awards

Fiscal Year	Total MBE Awards	Direct Awards	Section 8(a) Contracts	Reported Subcontracts
70	$ 76,909	-	$ 76,909	-
71	1,399,530	-	1,399,530	-
72	3,222,050	-	3,222,050	-
73	12,524,986	2,155,846	7,161,461	3,207,679
74	21,855,829	1,178,829	12,896,000	7,781,000
75	27,615,218	2,292,000	13,875,000	11,448,218
76	39,236,000	2,795,000	20,431,000	16,010,000
TP(3 mos.)	13,464,000	825,000	8,264,000	4,375,000
77	59,382,000	4,825,000	27,116,000	27,441,000
78(3 qtrs.)	52,316,000	11,011,000	18,614,000	22,691,000

Since program inception, more than $231 million in known NASA prime and subcontract awards have been made to minority firms. Approximately 2.1 percent of NASA dollars are now accruing to minority firms annually.

Of the 858 direct and Section 8(a) awards there have been but three instances in which persistent poor performance necessitated contract termination. These include contracts for minor construction, technical library services, and for photographic services. All three problem contracts were awarded early-on in the program, in 1972 and 1973. Though there have been no minority contract failures since that time, this is not to infer that we have not had contract problems, and in some cases, marginal performance.

Our earlier experiences did focus management attention on the need to work more closely with our new minority contractors, especially in ensuring their complete understanding of the scope of work and requirements of the contract effort. Therefore, it has become standard practice

Representative BRECKINRIDGE. Your statement leads to a very obvious conclusion and question. The Small Business Administration, of course, has a large responsibility in this area and also is responsible, to a large degree, for the failure that I am talking about.

Evidentally they have not provided the necessary care, attention, advice, and assistance which would have obviated the end results that are the subject of criticism.

This has got to be a "know-how" that is transferrable, if you at your development centers are able to transfer the technology that is a result of your applied research and your basic research.

If you are able to transfer that out to the would-be user and consumer, then let me say that you can make a tremendous contribution to the minority groups and interests and more particularly to entrepreneurs across the country if you transfer out the know-how to give them that going-in advice and support and assistance with reference to other contracts than NASA's.

This sort of interchange at the Federal level would seem to me to be of particular importance and interest to all of us and unless you consciously point it up in your participation in the task force on innovative development technology, perhaps that might not take place.

I think I know what you are saying. We have the so-called SCORE representatives, which are the senior citizens. They volunteer their time to the small business community. They tell them what their accounting system is and what the law is. They lead them around and help them get their feet under them.

However, evidentally they are not meeting with the success in their volunteer efforts that you are meeting with in your agency.

As we know, there are university business development centers which is another program that gets lost in the cracks and crevices here in Washington. This brings to bear at the State level through State programs—although in part funded in Washington—that type of university competence which is in the accounting business departments and the engineering schools. In other words, that is another package.

However, you probably have the most effective program. You have the most successful record in the nation in this area. If you had not come here today to testify before us, it probably would have continued to be the best-kept secret.

I am sure you have not tried to keep it a secret. You are like I am. I have been trying to trumpet so many things for so long in my life that I cannot hear anybody say anything back to me, that is, I am beginning to wonder if I will get any feedback.

But evidently you have within your general area the leading minority businessmen in the country. Of course, you contract across the country.

That cannot be the answer, though. The answer must be in your practices and procedures and your programs.

I would like to keep the record open for an enlargement of your routine procedures in terms of staffing and what it costs and how you handle it and how you operate.

Then I would urge you to particularly impress it upon the folks that you will be meeting with on the task force and the Small Business

direct interaction with individual companies to assist them in meeting their technical needs will provide the small businessman an additional return on his investment in the Nation's aeronautics and space program.

Mr. Chairman, although we believe that our efforts in behalf of small business have been extensive, I can assure you that we are not entirely satisfied with the results. Accordingly, NASA top management is currently involved in an intensive review and evaluation of the organization and procedures for accomplishing our R. & D. objectives with the specific intent of increasing the participation of small business. This review is also directed toward the development of new initiatives in conjunction with the President's White House Conference on Small Business. Our Administrator has determined that the agency should: Increase the R. & D. set-asides in supporting research and technology; enhance our procedures to further encourage unsolicited proposals from small research firms; and develop more efficient means for communicating NASA technical requirements to the small business community. In addition, we are extending our mandatory small business subcontracting test program which has proven so successful in our construction and institutional support procurements, to R. & D. hardware contracts to further promote the involvement of small business in our work.

We are currently working with top management of the Small Business Administration in developing these initiatives and expect to conclude specific interagency agreements for their implementation in the near future. Dr. Robert Frosch, NASA's Administrator, has agreed to participate as a principal speaker in a regional small business conference in Los Angeles in November to announce NASA's new initiatives in behalf of small business.

Mr. Chairman, this concludes my formal statement. My colleagues and I are available to respond to any questions you may have.

Representative BRECKINRIDGE. Thank you very much, Admiral.

As I indicated I have some, but not extensive, familiarity with NASA and its works. I have been familiar with some of its spinoff activities. I suppose you probably are the best organized and most effective Federal agency in that regard that we have in the country.

Your experience and contribution to the 28 agency task force that we have been talking about will be a valuable contribution.

There are two or three things that catch my attention. Without arguing the figure, you have analyzed your data in a variety of ways, but you end up with a bottom line figure which is about 2½ times, I guess, or maybe twice, the Federal average investment in small business.

You have 6.6 as the bottom line figure, if I read your table correctly. I think we have been saying that the Federal average has been about 3.5 or something like that.

The procurement, as such, is distinguished from R. & D. It has been in the neighborhood of 26 percent. I am talking about the U.S. procurement dollar.

Do you see a significant change in that in the years ahead, or do you feel that the nature of NASA's business is such, as was suggested by an earlier witness, when you get into defense systems which are large,

intent, as suggested in the Senate report accompanying the 1971 Appropriation Act, NASA has not imposed cost sharing on business entities which are unable to offset such cost through productiou or other services and are, therefore, not in a favorable position to make cost contributions. This policy effectively eliminates the cost-sharing requirement for the average small research firm.

I turn now to technology ultilization.

One of the more important aspects of NASA's mission, as provided for in its enabling act, is the transfer and application of the technology which emanates from its primary research and development work, to stimulate technological advance, enhance the quality of life, and to further the economic well-being of the Nation. Within NASA's technology utilization program special attention is given to assuring that the small business community's interests are well served.

Those identified technological innovations offering the best potential for development—transfer—by private industry are published quarterly in a tech brief journal, copies of which have otherwise been provided to the committee and subcommittees. Each year about 600 such innovations are announced in the journal, which is sent to more than 40,000 subscribers, many of whom are categorized as small business. In a single year, as many as 100,000 requests for additional information, which the program invites, are received and processed. These figures afford a measure of the success and importance of the dissemination system.

NASA and the Small Business Administration—SBA—have also combined to provide a more selective program of technology dissemination specifically directed toward the needs of small business. In this project NASA provides about 20 selected tech briefs, which the SBA then disseminates to small business firms.

Within the technology ultilization program NASA has established a network of seven regional industrial application centers—IAC's—which operate under NASA contracts to provide technical information and expertise for a modest fee to client companies. These centers are located in California, Connecticut, Pennsylvania, Indiana, North Carolina, Mexico, and Oklahoma. Typically, a client company may be seeking a material with certain properties to incorporate in its product, or a process to improve its manufacturing system; the IAC will search its vast computer file of technical information and perhaps discuss the need with NASA technical personnel in an effort to effectively respond to an inquiry.

The number of companies using the industrial application centers has increased to more than 10,000 over the past few years, and approximately half of these client companies are in the small business category. This results, in part, from the conscious NASA policy of keeping the service charges at modest rates to encourage the participation of the small business company.

A brief example of technology transfer made possible by NASA industrial application centers will underscore the value which this program activity adds in bringing about beneficial change in the small business community:

Kenics Corp., located in North Andover, Mass., is a leading manufacturer of motionless mixers widely used in chemical process industries and in water and waste treatment. Being a small company with limited resources, Kenics claims that they would be unable to afford

Representative BRECKINRIDGE. Do you think they balance out at the end of each year?

Admiral HOPKINS. Yes; I think we will beat our last year's statistics.

Representative BRECKINRIDGE. Thank you.

Please proceed.

Admiral HOPKINS. In NASA's testimony before the Senate Select Committee on Small Business on April 7, 1976, on the subject of small business in research and development, and more recently in our response to the chairman, Subcommittee on Antitrust, Consumers, and Employment, dated March 22, 1978, the major elements of our efforts in behalf of small business were presented. I would like to reiterate and update the more significant of these continuing NASA activities, and to advise of several new initiatives which are under immediate consideration.

I turn now to procurement planning.

The participation of small business is an important element of procurement planning at each NASA installation, in providing for its mission and institutional support requirements. When individual procurement plans are developed in accordance with NASA procurement regulation 3.852, generally for procurements of $500,000 or more, small business opportunities must be specifically defined. Such plans are submitted for approval at an appropriate management level depending primarily on the estimated value of the procurement. In this planning and review process, procurement opportunities are identified for small business set-asides, section 8(a) contracting, or the procurement is so structured as to facilitate the participation of small firms at the prime and subcontract levels. In conjunction with its planning activities, NASA sets for itself annual small business goals, and allocates a proportionate share of such goals to each of its field installations. The NASA small business goal for fiscal year 1978 is 10 percent of its total business awards. NASA considers the planning for and setting of annual procurement goals as an important technique for implementing its small business policy, and achieving basic program objectives.

I turn now to the procurement request review.

In addition to the procurement planning requirement, each individual procurement request—PR—is reviewed by a NASA small business specialist and a procurement center representative of the Small Business Administration—SBA—when assigned, to further insure that proper consideration has been given to each procurement. If a small business set-aside has not been previously established, such a recommendation may be made at this time. Should a set-aside recommendation not be accepted at the field level, the SBA representative may initiate an appeal from the NASA Installation Director's decision to the respective headquarters for a final determination by the NASA Administrator. These review and appeal procedures are provided for in the NASA procurement regulation.

I turn now to research information.

In its effort to facilitate communications between the Agency and the research community, NASA publishes an annual compilation of its research and technology activities in the research and technology objectives and plans summary, popularly referred to as the RTOP manual. A copy of this publication has previously been provided to the

Admiral HOPKINS. This directive also prescribes specific activities which are designed to enhance the participation of small business firms in NASA's research and development opportunities.

Turning now to some statistical highlights from our small business program, I would like to have inserted in the record a summary of NASA prime and subcontract awards to small business for each of the past 2 fiscal years.

Representative BRECKINRIDGE. Without objection, so ordered.

Admiral HOPKINS. In fiscal year 1977, small business awards totalled $254.96 million, which was 9.0 percent of the agency's total awards to business firms, an increase in both the value and percentage of awards over the previous year. In addition to the total direct awards, small business also received $277.68 million in subcontract awards bringing the total to $532.64 million. Thus, approximately 18 percent of NASA's total business dollars are accruing to small business firms through prime and subcontract awards.

I would also like to have inserted in the record a copy of NASA's prime contract awards to small business by the agency's three budget categories; Research and Development—R. & D.—Research and Program Management—R. & P.M.—and Construction of Facilities—C of F.

Representative BRECKINRIDGE. Without objection, so ordered.

[Material follows:]

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION SMALL BUSINESS PROGRAM—SUMMARY OF PRIME AND SUBCONTRACT AWARDS

[In thousands of dollars]

	To all business	To small business	To minority business
Fiscal year 1977:			
NASA awards	$2,838,117	$254,961	$31,941
JPL awards	137,903	36,975	1,746
Industry subcontract awards		240,708	25,695
Total	2,976,020	532,644	59,382
Small business percent of total business		(17.9)	
Minority percent of total business			(2.1)
Minority percent of small business			(11.1)
Fiscal year 1976:			
NASA awards	2,536,101	218,325	23,226
JPL awards	148,175	39,150	4,196
Industry subcontract awards		209,888	11,814
Total	2,684,276	467,363	39,236
Small business percent of total business		(17.4)	
Minority percent of total business			(1.5)
Minority percent of small business			(8.4)

Note: This table summarizes the reported small business awards and minority business awards, both prime contracts and subcontracts, with respect to the total NASA and JPL procurement awards to all business firms. Minority business awards are included in the small business awards.

Representative BRECKINRIDGE. Yes; Michaud. We were being shown around. We were standing at an appropriate place and following our leader. We were getting the right one. One of these birds came trumbling along on that dolly. It barely squeaked through the gateway and through the doorway.

Our narrator said: "You can see the limitations imposed upon the size of our weapons by the ceilings." I said: "Are you telling me that our space program is determined by the declaration of the Higgins Boat Works and surplus property?" [Laughter.]

I am still looking for an answer to that question. [Laughter.]

He walked on and took us to the next stopping point. He never answered.

I am concerned about that through way. I do not see it on our side.

Admiral HOPKINS. With your permission, I will give my statement.

Representative BRECKINRIDGE. Yes.

Admiral HOPKINS. It is a pleasure to appear before you today in response to your invitation to provide some highlights of NASA's small business program and, more specifically, to report on our efforts on behalf of small business in research and development.

I have with me today, Mr. Louis Mogavero, Chief, Technology Utilization, Mr. Floyd I. Roberson, Director, Technology Transfer, and Kenneth Kier, Director, Small and Minority Business Office. They will assist me in responding to specific inquiries or discussions that you may wish to pursue.

One of the mandates of the National Aeronautics and Space Act is that NASA conduct its activities so as to contribute to the most effective utilization of the scientific and engineering resources of the United States. Consistent with the mandate, NASA relies heavily on the industrial, scientific, and university communities to carry out its programs. Research and development is NASA's life blood with more than 90 percent of its procurement made using research and development funds. The Space Act also mandates that NASA enable small business concerns to participate equitably and proportionately in the conduct of the agency's work.

In carrying out these mandates, NASA has established a policy to insure that an equitable proportion of its procurement awards are placed with small business firms. This basic policy, and NASA's charge to its procurement installations is set forth in NASA Procurement Regulation 1.702.

I would like to ask this be inserted in the record.

Representative BRECKINRIDGE. Without objection, so ordered.

[Material follows:]

job that an agency may have to do. The National Science Foundation is rather unique in that it provides assistance. That is their basic mission. They are not buying things for the end use of the Government, like the Department of Defense does in buying weapons that must be effectively introduced in our military inventory. So, it is a little different when you are buying for your own use than when you are providing assistance.

So, with respect to goals, I think it would be fine to have goals and to have active programs required to achieve goals and measure the performance against those goals. But, I would be very hesitant to want to introduce quotas as such.

Representative BRECKINRIDGE. I was trying to refresh my recollection as I listened to you about this. You had some strong testimony on your efforts in the area of minority enterprise and strengthening that sector. I think we have written that into the law.

We have also written into law general Federal procurement guidelines with regard to DOD and GSA. It is in the law to try to stimulate small business.

All we are talking about here is the smaller adjunct of that tried and proven technique.

I know the reluctance against being mandated to doing anything. It is much better to be able to exercise your discretion.

However, when we write it in the report instead of into law, the discretion does not seem to be implemented as it is when it is written into the law.

We suggested the same technique for the enforcement of the antitrust laws to our friends in the Department of Justice and the Federal Trade Commission. They had the same reaction: "Leave us alone. Watch our track record."

We have, and we cannot find it. There is no track record.

So, maybe the answer this year is to write it into law and say: "You will spend so much for enforcement and we will fire the people who are not enforcing it."

That is something else to explore, I think. I have no set figure in mind.

Having had your personal reaction, Mr. Glover, the counsel, was pointing out that you have the authority to implement that set-aside proposal right now if you want to. It is there. If you say you do not want to, then all right. I am saying that you should go study it and let us talk about it.

Mr. DIETRICH. I think we have the authority that we need to set goals and to measure the performance against goals. I think you have given us a motivation. I think it is in a form that shows it would be desirable to do that.

Representative BRECKINRIDGE. You are being told this through these hearings. If that is correct, we are wide of the mark. We all have to take that responsibility.

Mr. Spira, do you have any questions?

Mr. SPIRA. Mr. Chairman, I have no questions.

Representative BRECKINRIDGE. I have a letter which is very commendatory of the Office of Management and Budget. I am trying to decide whether to make it a matter of record.

You have given some examples in your testimony of some of the things which you have been moving on. I think it is always helpful to have these things looked into.

On page 5 of your prepared statement, you advise us that you are continuing to analyze and identify small business procurement problems.

Then you outline a variety of programs.

Is there any way you can enlarge on that with examples that are plaguing small business and to which you are addressing your attention? Are there things legislatively that can be done to assist you? Are there things budgetarily that can be done?

Mr. DIETRICH. As we go through this process and identify problems, we find there is a broad spectrum of inhibitors. There are inhibitors that we can do something about immediately. There are inhibitors which are the result of legislation. There are others that result from the lack of uniformity in the way we do things. We can control and remove such inhibitors within the executive. However, it is more than a procurement and regulatory problem and much more extensive coordination must be done. This is the type of effort that Dr. Press and Dr. Baruch are after. One question is, for example, how do we implement the objectives of solar energy and what are the inhibitors? We are looking for the inhibitors that we can do something about in the Office of Federal Procurement Policy.

Representative BRECKINRIDGE. You are addressing yourself to the problem of this committee and every committee on the Hill. We all have the parameters imposed upon us by the assignments, as you pointed out.

What you and I are talking about is not just what you and your office can do, but what the Office of Management and Budget can do and what basically the executive branch of government can do.

What we are talking about on this side is the same thing, not what we, the Small Business Subcommittee on Antitrust can do, but what the Congress can do to facilitate your action.

Let me ask the question this way. Would it be unreasonable to suggest that perhaps a couple of months from now, within 60 days, Mr. Fettig, having reviewed this record and some of the questions which have been brought forward and some others which we might add perhaps in writing for his consideration, would come back and take another look?

Would this be productive, do you think, or not?

Mr. DIETRICH. I think Mr. Fettig would probably very much like to do that. I think it would be productive.

There are a couple of things that I would like to mention that can be done which are outstanding.

For example, in Senate bill 1264, which is the Federal Acquisition Act, which consolidates a lot of the procurement laws that govern how we do business. There are similar bills which have been introduced in the House. I do not have the numbers in front of me, but if there is acceleration of the passage into law, the Federal Acquisition Act would give us a better foundation for structuring many things. It has within it the correction of a lot of inhibitors to small high technology firms, such as the greater emphasis on unsolicited proposals and the use of functional specifications. When the Federal Requisition Act becomes

Let the record be kept open at this point for you to show what implementation has taken place and what implementation has not taken place and what implementation is in the process.

Mr. DIETRICH. That will be fine.

Representative BRECKINRIDGE. Without objection, so ordered.

[Subsequent information was received and follows:]

The Report of the Interagency Ad Hoc ("Rabinow") Panel is being sent to the Departments and agencies for implementation and action. The Departments and agencies will be requested to report back to OFPP as to progress in implementation. This will enable OFPP to: (1) assure that the Federal agencies are implementing the recommendations as quickly and efficiently as possible; and (2) to the extent necessary, modify and improve the program for subsequent incorporation into the activities of the White House Conference on Small Bnsiness.

Representative BRECKINRIDGE. The thing that is frustrating is this: We are all engaged in the same business. We sit on separate sides of the aisle, but my colleagues over here who are of another political party and my colleagues over here have differences when they leave this room, but when they talk about small business they are pretty close to being in accord, unless somebody thinks somebody's ox is getting gored.

But, generally speaking, we are working on the same team.

So are you and I. The problem is to maximize the assets available to the American people in an area of very significant and overriding authority on your part and a parallel responsibility on our part. That is the purpose of the hearing. That is what I am trying to get to.

I was intrigued by Dr. Baruch's testimony yesterday after he outlined in general terms what he was going to do; he said that he was not going to wait 18 months to file a report.

He was going to take the Rabinow report and the other reports that are before the committee and that are before you, and where he has a consensus he is going to start to work.

I suppose he will look for support from you and from the White House to start implementing these proposals.

That is what we so desperately need. We can get down to the kernels of disagreement later on. If the disagreement is wide enough we can legislate them whether we like it or not, or maybe we cannot. I found that frequently is the case, but the machinery is set to proceed.

The problem here is to proceed. So, I would particularly appreciate what Mr. Fettig has in mind, not only by way of what has not been done and what is intended and what is in process, but I would welcome his suggestion as to how we can pick this thing up and move it along.

We were supposed to be voting, I think, for a $20 billion deficit budget this year. Maybe it is the next fiscal year. The figures become meaningless up here after a while and the time frame is so unrelated to the aspirations of campaign commitments, that they do not mean anything.

But I remember the President was going to have a balanced budget in 1980. I would say that the golden goose and egg are right here. If you really want to balance the budget, and if you want to enlarge and stimulate the economy through the private sector, then here it is.

reports entitled "Small Firms and Federal Research and Development." ERDA concurs in this memorandum and the attachments thereto.

We enthusiastically support your efforts and look forward to a cooperative effort in the area of Small Business involvement in our Research and Development efforts.

Sincerely,

M. J. TASHJIAN, *Director of Procurement.*

NATIONAL SCIENCE FOUNDATION,
Washington, April 11, 1977.

MR. ROBERT F. TRIMBLE,
Assistant Administrator for Contract Administration,
Office of Management and Budget,
Office of Federal Procurement Policy Washington, D.C.

DEAR BOB: My apologies for the delay, but I did want to tell you that the final report of the Task Force on the role of small business firms in performing Federal Research and Development was excellent. It has met the concerns I expressed to you earlier extremely well in terms of concrete suggestions or recommendations.

I hope that it will be distributed at levels to affect the changes suggested.

Enclosed is a copy of the RANN solicitation we had mentioned to you earlier and that is consistent with the report. It represeuts the first research set-aside for small business in NSF's history

Sincerely,

WILLIAM H. WETMORE,
Director, Division of Intergovernmental Science and Public Technology.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION,
Washington, D.C., April 1, 1977.

MR. ROBERT F. TRIMBLE,
Assistant Administrator for Contract Administration,
Office of Federal Procurement Policy,
Office of Management and Budget,
Washington, D.C.

DEAR MR. TRIMBLE: I am responding to your memorandum of March 10, 1977 concerning a proposal for disseminating the report entitled Small Firms and Federal Research and Development. We concur with the findings in the report and believe that its recommendations, if seriously implemented, would be an important move towards alleviating several of the more serious impediments to the involvement of small business in Government R&D.

We agree with your intention of transmitting the report to the Heads of Departments and Agencies for reqnisite action. However, we also snggest that each agency be asked to report periodically on its progress in implementing its program for enhancing the participation of small research firms. Such reports should be specific as to the actions being taken, and the results attained. In addition, we recommend that the Office of Federal Procurement Policy establish a general oversight of this important and difficult segment of the Small Business Program.

We appreciate the opportunity of participating in the work of the panel, and of commenting on your plans for disseminating its final report.

Sincerely,

S. J. EVANS,
Assistant Administrator for Procurement.

U.S. GOVERNMENT SMALL BUSINESS ADMINISTRATION,
Washington, D.C., March 29, 1977.

MR. ROBERT F. TRIMBLE,
Assistant Administrator for Contract Administration,
Office of Federal Procurement Policy, OMB, Washington, D.C.

DEAR MR. TRIMBLE: We have reviewed the draft Memorandum for Heads of Executive Branch Departments and Agencies, Subject: Increased Use of Small Technology Based Firms, and find it highly acceptable as currently written.

uniform interpretation of rules and regulations by all government procnring activities.

It would appear to us that he proposed memorandum would simply perpetnate the already vast proliferation of individual agency regulations respecting R&D contracting thereby contributing to the burden placed on a small business firms seeking business with the government.

Since ASPR 4–106.1(b) and FPR 1–1.712 both contain coverage on utilizing small business firms in R&D procurement, it would appear that these sections would be appropriate place for codification of the policies and recommendations set forth in the interagency panel report. Interestingly enough, the report does not make mention of the ASPR and FPR coverage in this area, nor does it make reference to the use of R&D pools composed of small businesses (ASPR 1–302.2; FPR 1–1.302–2).

Per our comments to OFPP on its proposed R&D acquisition policy document, we believe policy and procedural guidance in the area of R&D contracting including utilization of small business firms, needs to be promulgated in the primary procurement regulatory system (ASPR/FPR) in order to insure uniform implementation (if required) in secondary agency regulations.

In the interest of simplicity, we recommend there he only one point of reference within each primary regulatory system which a small business firm (or procuring activity) has to locate in order to find complete coverage on this subject, (i.e., ASPR 4–106.1(b) and FPR 1–1.712).

3. The first recommendation made by the panel concerns the development of formal programs by agencies to increase R. & D. awards to small business R. & D. firms. We believe that this recommendation cannot be fully implemented unless an adequate number of trained personnel are supplied to procurement activities to review potential contracts, determine suitability for small business awards or subcontracts, and counsel potential small business R. & D. performers. In addition, we think the recommendation should make reference to increased use of small business set-asides for certain types of R. & D. procurements (as determined by the individual agency) as this method may be the only viable way of overcoming many of the impediments noted in the panel's report.

4. Recommendations 4a, 4b, 4c, and 4e simply paraphase the provisions of ASPR 4–106.1(b) and FPR 1–1.712 and 1–1.762. Therefore, we do not feel it is necessary to repeat them. Perhaps the recommendations could simply make reference to the applicable regulations.

5. Special briefings for small business R. & D. firms, as suggested under recommendation 4d, could result in such firms gaining an unfair competitive advantage over other competing firms, thereby resulting in organizational conflicts of interest. We believe that the best method of briefing potential offerors of a solicitation's requirements is through the use of pre-proposal conferences which are open to all potential offerors, both small and large. We believe the emphasis under this recommendation should be on issuing solicitations which clearly and simply state the agency's R. & D. needs so as to minimize the amount of additional information which has to be made available at a briefing conference.

6. Recommendation 5 encourages unsolicited proposals. We believe if the submission of such proposals is to be encouraged, it is imperative that general policies and guidelines in this area be promulgated for civilian agencies in the FPR. At present, ASPR contains minimal coverage on this subject (ASPR 4–107) and FPR has no coverage. Lack of FPR coverage has undoubtedly had an adverse affect on submission of unsolicited proposals to many civilian agencies. As a result, many agencies including Interior, have promulgated their own regulations in this area. These regulations are diverse and lack uniformity, thereby creating another burden on potential R. & D. performers.

In addition, existing procurement regulations, including ASPR 4–107(4) and Interior Procurement Regulation 14–4.5101–3(f)(1), state that the submitter of an unsolicited proposal is not necessarily entitled to preferential treatment in the award of a contract unless certain conditions exist. However, the last part of recommendation 5 would seem to run contra to these regulations.

Accordingly, we recommend that OFPP first establish uniform policies respecting submission of unsolicited proposals, which, in turn, will be promulgated in the ASPR and EPR. Such policies should be established only after review by R. & D. agencies, and these policies should be included in the R. & D. acquisition document recently drafted by OFPP. The proposed memorandum could make reference to these policies and appropriate regulations.

7. We believe the term "in-house laboratories" used in recommendation 7 needs further clarification. The intent of this recommendation is not clear with

Mr. DIETRICH. It has been the law. You put it in there.

Representative BRECKINRIDGE. We require you get every addressee's agreement to a policy that you make?

Mr. DIETRICH. No.

Representative BRECKINRIDGE. Let us not say anything like that, then. Let us say what the facts are.

Mr. DIETRICH. We must coordinate policies with the agencies.

Representative BRECKINRIDGE. You coordinate them by developing them. This remains 18 months later undeveloped. Is that the bottom line?

Mr. DIETRICH. That is true.

Representative BRECKINRIDGE. Somebody did not want to comply?

Mr. DIETRICH. No.

Representative BRECKINRIDGE. Have you a list of memorandums that are in response to this that you could make available for the record?

Mr. DIETRICH. Yes; I can.

Representative BRECKINRIDGE. Would you do that?

Mr. DIETRICH. Certainly.

Representative BRECKINRIDGE. Without objection, so ordered.

[Subsequent information was received and follows:]

U.S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D.C., April 1, 1977.

MR. ROBERT F. TRIMBLE,
Assistant Administrator for Contract Administration,
Office of Federal Procurement Policy,
Office of Management and Budget, Washington, D.C.

DEAR MR. TRIMBLE: Thank you for the opportunity to comment on the draft OMB memorandum, "Increased Use of Small Technology Based Firms," your March 10 memorandum.

We have no objection to the recommendations of the ad hoc interagency panel or the draft Memorandum to Heads of Agencies.

We suggest, however, that the report of the interagency panel not be attached to any issuance as it infers conclusions from some very general observations that result in a less than objective presentation of the situation being addressed.

For example, the report notes the small share of total Government R&D obligations awarded to small business without specifying what portion of that total amount can reasonably be made available to industry. The report notes "The overwhelming percentage of the dollars in Federal R&D goes to development as opposed to research (basic and applied)" without noting that most of that distinction is directed by Congress in its authorizations for the conduct of these programs. While the report draws no erroneous explicit conclusions, it is riddled with statements inferring conclusions of questionable validity.

Sincerely,

E. ALVAREZ, *Director.*

OFFICE OF THE DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING,
Washington, D.C., March 31, 1977.

MR. ROBERT F. TRIMBLE,
Assistant Administrator for Contract Administration,
Office of Federal Procurement Policy,
Office of Management and Budget, Washington, D.C.

DEAR BOB: In response to your letter of March 17, 1977 I believe that the draft memorandum you propose is appropriate. There is only one change that I propose and that is to substitnte "directly witb small firms" for "with small firms" at the end of the last sentence in the second paragraph.

Also, as we discussed in a recent phone conversation I have a comment on the Recommendations of the Ad Hoc Interagency Panel. With regards to recommendation 2, I believe that it is impractical, in most cases, for the Department

problems with it, I need to know what they are. I need to know what you intend to do, if anything, and why or why not.

Just start from the point of view of work already undertaken.

Mr. DIETRICH. Let me put our office in context here. Our role in the Office of Federal Procurement Policy, which is within the Office of Management and Budget, is contained in Public Law 93-400. We were inserted into the Office of Management and Budget by Public Law 93-400. Prior to this law, there was not any Office of Federal Procurement Policy. We do not have any responsibilities for the development of the President's budget whatsoever. Our budget is a separate line item within the Office of Management and Budget. We were put in OMB by Congress so that we would have the clout with the budget to reinforce our procurement regulatory authority when we promulgated regulations and policies. It has worked fairly well.

You were looking for a man on a white horse and a lance. Maybe that is the wrong term to use—"lance." [Laughter.]

I look to Mr. Fettig as our man with a lance on that white horse. He has shaken up the procurement community. He is doing things and he is moving rapidly. He is a knowledgeable man. He is an engineer by training. He is a businessman by training. He has good experience. So, I think if I would look to anyone, it would be to look to Mr. Fettig to get something done here.

The law limits us only to the procurement regulatory things. With respect to inovation for the public and Government use, it is a lot more broad as you have alluded to than just the procurement regulatory aspects.

The Rabinow report bassically dealt with some of the procurement regulatory things that were looked upon to be some of the inhibitors to making business easier for small businessmen to do business with the Government. Our organization, of course, sponsored that particular study.

As I mentioned in our prepared testimony, when Mr. Fettig came in, he saw that, plus several other actions that we had in minority and small business activities. He tried to consolidate these into something that would give greater emphasis. In fact, that is being done and being brought together for a White House conference planned next year where we thought it would give an even greater emphasis and would be appropriate to have Presidential-type cognizance.

That does not mean that we have stopped working on any of these individual recommendations and individual initiatives within our office. We have been continuing to do that as time has gone on.

Representative BRECKINRIDGE. Can you tell me why it has not been published until the committee published it?

I want to understand the process. It takes that investment of the taxpayers' money. The taxpayer does not have any access.

Mr. DIETRICH. It was distributed at the procurement focal points in the agencies. I think you published the distribution list that showed it went to the main agencies. They had that in March 1977. There was nothing that said they could not implement any of those recommendations that they had a prerogative to.

Representative BRECKINRIDGE. Was there anything said that they should?

Representative BRECKINRIDGE. Before I get into my general questions, let me say this.

What you have directed the committees' attention to is very interesting and promising. I think you know better than I, perhaps, that all things eventually end up in OMB. There is a feeling in various people, including this member, perhaps that they frequently end up in OMB. We do not hear further from them.

That relates to my particular reference this morning to the so-called Rabinow report.

With the large authority and responsibility that Congress has over the years placed in OMB, the real fundamental question, I think, was the one that we talked about before you gentlemen came on this morning.

That is the multiplicity of independent studies and proceedings, and, if you will, hearings on the Hill, all of which are trying to point in one direction. That one direction, of course, ends up ultimately at the White House. However, the OMB is the final point along the way.

There is a frustration which this committee reflects. It reflects the testimony that comes before it and the complaints that it receives from its constituents and from the small business community.

This addresses itself in the final analyis perhaps to your office because of the all-pervasive nature of your authority and your responsibility and your exercise of that.

One of those problems, of course, is the fiscal guidelines that you issue to try to help balance the budget which is a goal that we all aspire to and may someday achieve after you and I have gone, or maybe after I have gone, but maybe before you have gone, I hope.

In that context, it seems to me that we look now in this area to the President's task force—the 28 agency task force—and as some witnesses have suggested, we look particularly at Dr. Baruch, by virtue not only of his responsibility, but his background and talents in this area.

We look to him hopefully—and I am saying this now for the purpose of soliciting your views—to take the Rabinow report and the other reports which are before the Congress, which have been mildewing for a long while. I do not think they are going to change much in the next 18 months on the examination of the subject. I think we might quantify the argumentation. I think we might find some new approaches, but basically I think all the data are going to show that we are overlooking the goose that lays the golden egg. In fact, we are not only overlooking it, but we are killing it. I am talking about small business.

I say that in the larger context of the national economy which you have to produce some answers for, to you and Brother Schultz and Mr. Eisenstat and Jack Watson and a handful of other people.

The frustration is this. What happens to the Rabinow report? What happens to the "Better to Lend than Spend" report? What happens to the studies that constantly point in but a single direction to a segment of our society which has within it the potential, the power, the capacity, and the proven record of innovating development, of high technology development, of jobs creation, of revenue production, and receives so little attention?

There is a great variety of attention. You have recited some of them. This is increasing attention. That is good. That is a healthy sign.

We also would like to remove the cost sharing requirements for unsolicited proposals from small businesses.

We would also like to simplify the procurement procedures for basic and applied research and advanced technology. Such simplifications would be limited to efforts in the base of science and technology and not in the major systems acquisition area. For major systems acquisitions we want to have the broadest spectrum of new and innovative ideas regardless of the source.

One of the other things we have coming along in the future which should help us identify the high technology small firms is the Federal Procurement Data System, a contract data bank, information for which will begin to be reported in October. The first output of information for the system should be available during the first quarter of 1979. We will be able to look at the trends for analysis and evaluation and possibly pinpoint areas for greater emphasis.

SUMMARY

In summary, I have attempted to show the myriad of actions we have taken and have underway which add up to significant emphasis being given to small high technology firms. We feel that your hearings are constructive and certainly will give

10 industry associations, the General Accounting Office, Congressional staffs, and individuals that have expressed interest. Before we finalize the policy we will solicit formal comments from all executive branch agencies which have R&D and all interested non-Government organizations. The policy addresses such subjects as unsolicited proposals, cost sharing, recoupment of R&D investments by the Government and the use of Federally-Funded Research and Development Centers. All of these subjects will have an impact upon small innovators. Our objective is to remove the inhibitors to innovation.

We are currently developing a single set of acquisition regulations, combining the Armed Services Procurement Regulation and the Federal Procurement Regulations into one set of simplified Government regulations. This in and of itself will make it easier for small businesses to interact and do business with the Government. It is a high priority project, and it is an extensive one. We have over 50 people participating from the Department of Defense and the General Services Administration, and we released the first draft section for comment. We will be releasing subsequent draft sections for comment on an incremental basis and expect to have the final draft completed by January. Our goal is to have the Federal

WHAT IS BEING DONE

One area which will aid in removing inhibitors to participation in Government business by small high technology firms is in profit policy. We are examining profit with a view to giving greater recognition to desired capital plant and facilities investments by small high technology firms as well as others. Such a policy has been recognized in the Department of Defense and by CAS Board Standard 414. We are looking at the implications of applying that profit policy across the Federal Government.

Another activity in which we are participating is the policy implementation of P.L. 95-224, which differentiates between assistance and procurement. There has been draft interim guidance published in the Federal Register that prohibits the use of grants to circumvent competitive procurement policies and when appropriate permits research grants to be used with profit-making organizations. This expands that market for small high technology firms.

One of our major ongoing efforts is the revision of OMB Circular A-76, which sets forth policies and procedures relative to dependency on the private sector for providing goods and services to the Government. Within that context we are addressing the criteria for research and development as to what will be conducted in-house and what by the private

a new innovative idea comes from a small high technology firm, and is acceptable and proves beneficial, that there will be many willing to assist it to produce and bring that particular innovative idea into the marketplace. Experience in the past has shown that small innovative contractors participating in major system acquisitions, usually participate as subcontractors. In such cases they may be a common supplier to competing prime contractors -- especially if they have new innovative ideas. We have been encouraging agencies acquiring major systems to use incentives to expand prime contractors' use of small businesses -- including high technology small businesses.

We have taken other actions in which we have tried to remove some of the inhibitors to greater participation by small high technology firms. For example, we had a project to improve communication in the announcements in the Commerce Business Daily (CBD) and make them more accessible to all businesses. We have encouraged agencies to synopsize their research and development projects earlier in the CBD and in pamphlets that can be widely distributed to assist the small high technology businessmen to more readily identify Government interests. The National Science Foundation, NASA and the Department of Energy have such initiatives. Other agencies use periodic briefings to industry, large and small, in their areas of

sales and distribution to either the Government or the commercial market. The first and second activities each require significant investments. Recovery of these investments does not begin to occur until well into the third phase when the products are purchased either by the public or by the Government. Through this continuing analysis we are identifying acquisition policies, regulations and procedures which adversely impact or inhibit small high technology businesses' participation with the Government. As each is identified we evaluate alternatives in the context of overall regulatory relationship of the Government with the private sector and take or plan to take appropriate actions. For example: we have put great emphasis on the shift to the Government buying commercial products rather than buying unique items. We have also shifted to greater dependence on commercial distribution channels rather than duplicative Government systems. We are shifting to the use of functional, end-objective, specifications, where practicable, in lieu of detailed specifications. The emphasis on using functional specifications is contained in OMB Circular A-109 for major systems acquisitions and in S. 1264, the proposed Federal Acquisition Act. These actions will not only reduce costs but should broaden the base of acceptable products that the Federal Government will, in fact, buy. These reforms should result in greater industry involvement and a greater opportunity

of solar energy objectives. We will be involved with these studies and most certainly will be intimately involved with any procurement policy or regulatory implementing actions. I cannot, of course, forecast how these studies will come out, but our objective is to remove inhibitors to innovation, which includes inhibitors to small high technology businesses.

Total Federal R&D expenditures have nearly doubled since 1965, but Federal R&D as a percent of the total Federal budget has declined from 12% of the Federal budget down to about 6%. In that same period there has also been a 10% decline in industry participation in Government sponsored research and development. Small business participation in research and development has, however, maintained about 3-1/2% of the total research and development dollars. This currently equates to 8% of the total that goes to industry.

One agency, the National Aeronautics and Space Administration (NASA) in FY 77 had 9% of its awards made to small business. For new work with new contracts over $10,000 -- 22% went to small businesses. By including subcontracts from some 87 of NASA'a prime contractors, 18% of NASA's total FY 77 awards were made to small business. This addresses small business recipients of R&D funded contracts, and should not be interpreted to mean that all of these awards were made to small high technology firms.

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

OFFICE OF FEDERAL
PROCUREMENT POLICY

HOLD FOR RELEASE UNTIL DELIVERY
Expected at 10:00 A.M.
Thursday, August 10, 1978

STATEMENT OF THE
HONORABLE LESTER A. FETTIG
ADMINISTRATOR FOR FEDERAL PROCUREMENT POLICY
OFFICE OF MANAGEMENT AND BUDGET
BEFORE THE
JOINT SENATE COMMITTEE ON SMALL BUSINESS
AND SUBCOMMITTEE ON ANTI-TRUST, CONSUMERS
AND EMPLOYMENT
HOUSE COMMITTEE ON SMALL BUSINESS

Mr. Chairman and Members of the Committee and Subcommittee:

I am pleased to have this opportunity to meet with you to discuss the activities of the Office of Federal Procurement Policy relative to small high technology businesses.

I would like to, first, say a bit about the Office of Federal Procurement Policy and present some relevant background data on procurement trends. I will then discuss what OFPP had done as a policy group, and actions we have taken that affect how small high technology firms do business with the Federal Government. I will then move on to discuss current OFPP programs and, finally, our planning for future actions.

Mr. DIETRICH. Another initiative we have been working and are in a position to acquire formal comments in the near future, is a policy addressing the acquisition of research and development. By the way, our coordination procedures are quite extensive. An early draft of this particular policy has been circulated informally for comment to agencies, ten industy associations, the General Accounting Office, Congressional staffs, and individuals that have expressed interest.

Before we finalize the policy we will solicit formal comments from all executive branch agencies which have R. &. D. and all interested non-government organizations. The policy addresses such subjects as unsolicited proposals, cost sharing, recoupment of R. & D. investments by the Government and the use of federally funded research and development centers. All of these subjects will have an impact upon small innovators. Our objective is to remove the inhibitors to innovation.

We are currently developing a single set of acquisition regulations, combining the Armed Services Procurement Regulation and the Federal Procurement Regulations into one set of simplified Government regulations.

This in and of itself will make it easier for small businesses to interact and do business with the Government. It is a high priority project, and it is an extensive one. We have over 50 people participating from the Department of Defense and the General Services Administration. We have released the first draft section for comment. We will be releasing subsequent draft sections for comment on an incremental basis and expect to have the final draft completed by January. Our goal is to have the Federal acquisition regulation ready for publication by August 1979. To augment the regulation, non-regulatory, explanatory manuals designed essentially for basic understanding of particular subjects will be issued. The need for a small business contracting manual is being examined.

With respect to the future, we plan to examine such things as the cost to a company submitting proposals to the Government in response to a solicitation. For small high technology firms, we plan to look at the possibility of prequalification and then providing the up-front money for preparing proposals to the Government. The current practice requires them to either borrow or use their limited capital with no recourse for recovery after the contract is awarded. We may test this approach on a limited basis first to see what problems may arise.

We may also want to change the independent research and development and bid and proposal—I.R. & D./B. & P. formulas for the small high technology firms, to give them more dollars rather than a percentage formula of past contract values as is now the case.

For rapidly growing small high technology firms, we think the I.R. & D./B. & P. allowances should parallel growth.

We would also like to remove the cost sharing requirements for unsolicited proposals from small businesses.

We would also like to simplify the procurement procedures for basic and applied research and advanced technology. Such simplications would be limited to efforts in the base of science and technology and not in the major systems acquisition area. For major systems acquisitions we want to have the broadest spectrum of new and innovative ideas regardless of the source.

The Commission recognized in commercial practice the seller, not the buyer, retains title to all patents resulting from the performance of a contract and that the question of patent rights should be measured against commercial practices to determine its affect on the marketplace.

"Promoting fair dealing and equitable relationships among the parties in Government contracting" is another mandate of Public Law 93-400 on OFPP. A question of equity arises when the Federal Government in an R&D contract both obtains title to resulting patents and requires recoupment.

Similarly, an assistance transaction which is in the public interest which requires cost sharing by the recipient and does not let the recipient retain title to resulting patents also raises a question of equity.

FEDERAL PAPERWORK

Another objective we have within OMB is to minimize the differences in administrative requirements between procurement contracts and grants/cooperative agreements. The Commission on Federal Paperwork specifically recommended that this be done for colleges and universities. It appears to me that a uniform Federal patent policy to be applied in both assistance and procurement is desirable.

ALLOCATION OF RIGHTS

With the background of these related policies I will now turn to the basic question of Federal patent policy -- the allocation of rights. This question arises because it is the policy of the Federal Government to rely on the private free enterprise system for the goods and services needed by the Government and because it has been determined to be in the public interest to assist and support organizations performing research and working in certain technology areas (such as energy). A primary goal of Federal patent policy is and should be the utilization or commercialization of the technology.

Mr. Chairman, I believe that this is the most important aspect of the questions surrounding Federal patent policy -- it's objectives. In one word it is commercialization. It gets back to the basics of why we have patents in the first place -- to get commercialization. Commercialization means increased productivity, better and more products, improved standards of living, anti-inflation (such as demonstrated in miniature electronics), improved trade balances (high technology industries continue with positive balances), and employment. Commercialization is clearly in the public interest.

But, what about other aspects of public interest. How do we protect the public interest from "windfall" profits and from inventions being suppressed? Such protection must be provided. To protect against "windfall" profits we should

assistance transactions, OMB through the budget process by policy requires cost sharing -- in some cases up to fifty percent (coal gasification demonstration conducted by the Department of Energy).

Recoupment

Similarly, in procurement transactions, when there is a clear potential benefit that commercial sales will result from a Federal R & D contract, the Council on International Economic Policy Decision Memorandum 23 of August 1974 requires that a recoupment provision be in the contract. This policy is still in effect and a most used example is the C-5A engine contract with General Electric (GE) which has resulted in the Federal Government receiving approximately $18,000 for each commercial engine that GE sells for use on the DC-10, 747 and A-300 airbus.

OFPP is in the final stages of development of a procurement policy on R & D contracting which will include an executive branch implementation of the Decision Memorandum.

Science and Technology Policy

There is one more public law that should be included in this background for discussing patent policy and that is Public Law 94-282, the National Science and Technology Policy, Organization, and Priorities Act of 1976. Section 102(a) on the declaration of policy states:

> ". . .the Congress declares that the United States shall adhere to a national policy for science and technology which includes the following principles:
>
> "(5) The development and maintenance of a solid base for science and technology in the United States, including: (A) strong participation of and cooperative relationships

BACKGROUND -- OFPP

First, perhaps it would be appropriate to review the role of OFPP in this subject area. OFPP was established in 1974 by Public Law 93-400. The prescribed authority is as follows:

> "Section 6.(a) the Administrator shall provide overall direction of procurement policy. To the extent he considers appropriate and with due regard to the program activities of the executive agencies, he shall prescribe policies, regulations, procedures, and forms, which shall be in accordance with applicable laws and shall be followed by executive agencies (1) in the procurement of -
>
> (A) property other than real property in being;
>
> (B) services, including research and development;
>
> (C) construction, alteration, repair, or maintenance of real property;
>
> and, (2) in providing for procurement by recipients of Federal grants or assistance of items specified in clauses (A), (B), and (C) of this subsection, to the extent required for performance of Federal grant or assistance programs." (emphasis added)

Public Law 93-400 clearly gives to OFPP the authority to prescribe policies and regulations in the procurement of research and development.

One of our major ongoing efforts is the revision of OMB Circular A–76 which sets forth policies and procedures relative to dependency on the private sector for providing goods and services to the Government. Within that context we are addressing the criteria for research and development as to what will be conducted in-house and what by the private sector. We have had a first pass study to document the role of the laboratories in the Federal Government.

We examined the laboratories' role involving support of major systems acquisitions, support of less than major systems, management of the base of science and technology related to agencies' mission, and finally, the support for ongoing operations. First, we must determine what must be done in these areas by Government personnel to have a viable work force. Then we will develop the criteria for what is to be done by the Government and what is to be done by the private sector. We are now going into a second more extensive study of the role of laboratories and will then develop the necessary criteria.

Another important area to small high technology business particularly, and industry in general, involves patents and data rights. There is a study initiated by this administration under the cognizance of the science advisor, assisted by the Department of Commerce, to address these issues.

I might mention on the side that Mr. Fettig addressed the Senate Small Business Committee on the institutional patent policy about a month ago. I would like to refer you to that particular testimony for inclusion in your record.

[The information follows:]

Two, activities which involve production and acceptance of the new innovative product in the marketplace; and,

Three, activities which involve end-product sales and distribution to either the Government or the commercial market.

The first and second activities each require significant investments. Recovery of these investments does not begin to occur until well into the third phase when the products are purchased by either the public or by the Government. Through this continuing analysis we are indentifying acquisition policies, regulations and procedures which adversely impact or inhibit small high technology businesses' participation with the Government. As each is identified, we evaluate alternatives in the context of overall regulatory relationship of the Government with the private sector and take or plan to take appropriate actions. For example, we have put great emphasis on the shift to the Government buying commercial products rather than buying unique items. We have also shifted to greater dependence on commercial distribution channels rather than duplicative Government systems. We are shifting to the use of functional, end-objective specifications, where practical, in lieu of detailed specifications.

The emphasis on using functional specifications is contained in OMB Circular A–109 for major systems acquisitions and in S. 1264, the proposed Federal Acquisition Act.

These actions will not only reduce costs but should broaden the base of acceptable products that the Federal Government will, in fact, buy. These reforms should result in greater industry involvement and a greater opportunity for a broad spectrum of small businesses—high technology small businesses included.

With respect to all three phases, this administration has increased emphasis on the use of minority businesses, which incidentally includes some small high technology businesses. It has been the President's desire to double or triple minority business participation as Government suppliers of goods and services. OFPP has taken a leading role in the program.

In the phase involving the development and demonstration of innovative technology, many actions have been taken. A–109 recognized that there is no segment, in or out of the Government, large or small, that has a corner on new and innovative ideas. So in A–109 we inserted the requirement that small businesses be given an opportunity: "* * * in order to achieve preferred system solution, emphasis will be placed on innovation and competition. To this end, participation of smaller and new businesses should be encouraged. * * *" This requirement has been implemented by the agencies, for example, in the Department of Defense Directive 5000.1: "Competent industry and educational institutions regardless of size shall be the primary sources for the exploration of competitive system design concepts. * * *"

NASA and the Department of Energy have similar documents which implement A–109. We feel that if a new innovative idea comes from a small high technology firm and is acceptable and proves beneficial, that there will be many willing to assist it to produce and bring that particular innovative idea into the marketplace. Experience in the past has shown that small innovative contractors participating in major system acquisitions usually participate as subcontractors. In such cases they may be a common supplier to competing prime contractors—especially if they have new innovative ideas. We have been

By agreement of the witnesses, Admiral Hopkins has permitted Mr. Fred H. Dietrich, who is appearing on behalf of Mr. Lester Fettig, the Administrator for Federal Procurement Policy, Office of Management and Budget, to proceed.

We are delighted to have you here, Mr. Dietrich. We look forward with a great deal of interest to your testimony.

STATEMENT OF FRED H. DIETRICH, ASSOCIATE ADMINISTRATOR, SYSTEMS AND TECHNOLOGY, OFFICE OF FEDERAL PROCUREMENT POLICY, OFFICE OF MANAGEMENT AND BUDGET, ACCOMPANIED BY HERMAN E. SHIPLEY, DEPUTY ASSOCIATE ADMINISTRATOR, SYSTEMS AND TECHNOLOGY, OFFICE OF FEDERAL PROCUREMENT POLICY, OMB; AND OWEN BIRNBAUM, DEPUTY ASSISTANT ADMINISTRATOR FOR CONTRACT ADMINISTRATION, OFFICE OF FEDERAL PROCUREMENT POLICY, OMB

Mr. DIETRICH. Thank you, Mr. Chairman.

We are pleased to have this opportunity to meet with you to discuss the activities of the Office of Federal Procurement Policy relative to small high technology businesses.

I have two of my colleagues with me today. Mr. Shipley is my Deputy, and Mr. Birnbaum, is the Deputy Assistant Administrator for Acquisition Law and is Assistant to the Administrator for Small and Minority Businesses.

Mr. Fettig regrets not being able to meet with you today. I understand you may be having hearings at a later date and I am sure that Mr. Fettig would very much like to be with you.

Representative BRECKINRIDGE. Let me say that we would be delighted to have him.

Mr. DIETRICH. I would like to summarize, in the interest of time the statement that Mr. Fettig has prepared.

I would like to, first, say a bit about the Office of Federal Procurement Policy—OFPP—and present some relevant background data on procurement trends. I will then discuss what OFPP had done as a policy group, and actions we have taken that affect how small high technology firms do business with the Federal Government. I will then move on to discuss current OFPP programs and, finally, our planning for future actions.

I will first talk about OFPP and the trends in Government business.

OFPP is a regulatory body constituted by the Congress under Public Law 93-400. We are as the Congress desired, an austere group, and rightfully so. We do not have all-inclusive authority regarding the conduct of research and development sponsored by the Federal Government. We do have the responsibility for the regulatory interface with industry as to how the Government conducts business. We have 20 professionals in the Office and quite an extensive list of active projects. As an example of the wide range of subjects, Mr. Fettig, our Administrator has testified to congressional committees 13 times in the past 6 months, and not twice on the same subject. We have a myriad of regulatory and related initiatives that impact in varying degrees the relationship bteween small high technology businesses and the Government.

Council on Education, and the National Association of State Universities and Land Grant Colleges. Such efforts will also acquaint university researchers with complex problems associated with industrial research which can stimulate basic research in areas likely to benefit society. The National Science Board, in January of 1978, adopted the following resolution:

RESOLUTION APPROVED BY THE NATIONAL SCIENCE BOARD AT ITS 195TH MEETING ON JANUARY 19–20, 1978, ON BASIC RESEARCH IN INDUSTRY

The National Science Board unanimously decided that the Foundation's policy on the support of basic research by private profit organizations should be modified as indicated by the following language, which should be substantially reflected in National Science Foundation policy documents:

> The National Science Foundation welcomes unsolicited proposals from commercial firms. But it also wants to avoid substituting Federal support for normal commercial investment in research or compromising the vitality of research in educational institutions, where research makes a special added contribution to science education. Thus, unsolicited proposals for scientific research project support from commercial firms may be funded where: (*a*) the project is of special concern from a national point of view; (*b*) special resources are available in industry for the work; or (*c*) the project proposed is especially meritorious.
>
> The National Science Foundation is also particularly interested in supporting research projects that couple the research resources and perspectives of industry with the research resources and perspectives of universities. It therefore especially welcomes proposals for cooperative research projects involving both universities and industry.

The committee strongly endorses the concept of industry/university cooperative science activities and increased participation of industrial researchers in NSF-supported programs. In this way many more researchers can be given an opportunity to contribute to the advancement of science through such efforts, and the Nation, as a whole, will benefit over the long term.

Appropriate technology

The increasing impetus throughout the Nation toward the development of appropriate technology is aimed at ameliorating some of our most serious and persistent problems. The conservation of energy and natural resources, environmental protection, economic development for low income people, and revitalization of individual and community enterprise may all be significantly aided through this approach to technological innovation.

The Foundation, especially through its Applied Science and Research Applications Directorate and its Office of Science and Society in the Directorate for Science Education has sponsored valuable research in this area. The committee wishes to encourage this activity and to urge the Foundation to plan a program on appropriate technology within its ASRA Directorate. The committee urges the NSF to give more emphasis to its support for appropriate technology activities throughout the agency during fiscal year 1979 and anticipates that the program plan will be implemented in fiscal year 1980.

physically handicapped and the mentally retarded, including communications research. The Foundation is encouraged to conduct interdisciplinary research in this area.

S. 2549 provides $36 million for the problem-focused research applications subactivity for fiscal year 1979, and $40.77 million for fiscal year 1980. Together with $3.5 millions in deferrals, the fiscal year 1979 program totals $39.5 million. This research deals with selected societal problems of national importance. The major NSF effort in this area is Earthquake Hazards Mitigation, estimated at $26.4 million for fiscal year 1979. This includes research on siting, design, and policy. Other areas include chemical threats to man and the environment, alternative biological sources of materials, and community water management. The latter addresses the Nation's capability and capacity to manage effectively and efficiently the use and reuse of water in an urbanized environment.

An amount of $15 million is authorized for the intergovernmental science and research and development incentives subactivity for fiscal year 1979, an increase of $9 million above the NSF request. The authorization also includes $16.99 million for this subactivity for fiscal year 1980.

This program facilitates the integration of scientific and technical resources into policy formulation, management support, and program operation activities of State and local governments. It also tests and evaluates selected incentives which the Federal government may use to increase research and development investment by the private sector of the economy and to accelerate the introduction of innovative technology into commercial use where new products, processes, or services are needed in the national interest.

Included in the committee authorization is $4 million each in fiscal years 1979 and 1980 for the small business innovation program. This program could serve as a model for use on a Government-wide basis in small business research and development contracting. In making awards under this program the committee directs the Foundation to recognize the program's unique goals and to use peer reviewers and criteria for selection which are responsive to those goals. An accelerated review process will probably be required in order to maintain continuity between phase I and phase II of this program. Every effort must be made to avoid the serious hardship imposed on small businesses when a hiatus in funding occurs.

The committee authorization also includes $5 million each in fiscal years 1979 and 1980 for the State Science, Engineering, and Technology program. This will allow the Foundation to assist States in implementing the plans developed during the planning grants phase, which is now coming to completion.

The authorization includes $10 million for the Intergovernmental Program in fiscal year 1979. The committee has increased the amount requested by the Foundation by $5 million to continue the State Science, Engineering, and Technology program for another year. This will allow the Foundation to assist States in implementing the plans developed during the planning grants phase, which is now coming to completion. It also includes $5 million for the industrial program of which $4 million is provided for the small business innovation program.

ties, and the general public. Increased support is also to be made available for proposals relating to biomedical research.

S. 2549 provides $2.7 million for the Science for Citizens program. Funds will support projects that facilitate the interaction of scientists with citizens and citizens groups and for projects which provide citizen groups with scientific and technical information as well as related expertise. Funds will also be available to establish regional centers and institutes to further the purposes of the science for citizens program. The $9 million authorized for the entire science and society program for fiscal year 1980 will continue support for the above activies, with increased emphasis on support for the development of additional mechanisms to improve interaction between scientists and nonscientists.

Applied Science and Research Applications

	Millions
Actual, fiscal year 1977	$62.4
Estimate, fiscal year 1978	57.9
NSF budget request, fiscal year 1979	67.0
Plus fiscal year 1978 deferral	6.9
Total, fiscal year 1979	73.9
Committee recommendation, fiscal year 1979	77.5
Plus fiscal year 1978 deferral	6.9
Total, fiscal year 1979	84.4
Committee recommendation, fiscal year 1980	87.77

The Foundation's Applied Science and Research Applications (ASRA) activity seeks to increase the contribution of science and technology to the Nation by identifying and supporting research and related activities having the highest potential for contribution to the understanding and resolution of significant problems.

The objectives of ASRA are to: (1) Foster growth of fundamental scientific understanding and capability in areas having the most immediate relevance to the understanding and resolution of emerging or existing national problems; (2) focus U.S. scientific and technological capabilities on selected problems of national significance where NSF can make a unique contribution; (3) encourage the application of fundamental scientific and engineering capabilities to the solution of significant problems in the public and private sectors and shorten the time between scientific discoveries and the application of these discoveries for societal use; and (4) increase the effectiveness of the public and private sectors in appropriately utilizing science and technology.

S. 2549 authorizes $77.5 million for ASRA for fiscal year 1979. This amount together with $6.9 million in fiscal year 1978 deferrals brings the program total to $84.4 million, $10.5 million more than the amount requested by NSF. $2 million is set aside for a handicapped research program. The authorization provides that $5 million to be used to continue the State science, engineering, and technology program, and $4 million is to be used for the small business innovation program. The bill also authorizes $87.77 million for ASRA programs in fiscal year 1980, including $2.26 million for a handicapped research program, $5 million for the State science, engineering and technology program, $4 million for the small business innovation program. In both years,

(1) Mathematical and Physical Sciences and Engineering, $268,300,000.

(2) Astronomical, Atmospheric, Earth and Ocean Sciences, $227,300,000.

(3) United States Antarctic Program, $50,700,000.

(4) Biological Behavioral, and Social Sciences, $158,000,000.

(5) Science Education Programs, $77,600,000.

(6) Applied Science and Research Applications, $67,000,000.

(7) Scientific, Technological, and International Affairs, $24,300,000.

(8) Program Development and Management, $54,800,000.

SEC. 3. Appropriations made under authority provided in sections 2 and 5 shall remain available for obligation, for expenditure, or for obligation and expenditure for periods specified in the Acts making the appropriations.

SEC. 4. From appropriations made under this Act, not more than $5,000 each for fiscal year 1979 and fiscal year 1980 may be used for official consultation, representation, or other extraordinary expenses upon the determination of the Director of the National Science Foundation, and his determination shall be final and conclusive upon the accounting officers of the Government.

the Speaker of the House of Representatives, to the President of the Senate, to the Committee on Science and Technology of the House of Representatives, and to the Committee on Human Resources of the Senate a written report containing a full and complete explanation of the transfer involved and the reason for it, or

(2) before the expiration of thirty legislative days both the Committee on Science and Technology of the House and the Committee on Human Resources of the Senate have written to the Director to the effect that they have no objection to the proposed transfer.

42 USC 1882.

SEC. 7. Notwithstanding any other provision of this or any other Act, the Director of the National Science Foundation shall keep the Committee on Science and Technology of the House of Representatives and the Committee on Human Resources of the Senate fully and currently informed with respect to all of the activities of the National Science Foundation.

Feasibility Study.
42 USC 1864 note.

SEC. 8. (a) The Director of the National Science Foundation, in consultation with the Director of the Office of Science and Technology Policy, the Secretary of Energy, the Administrator of the National Aeronautics and Space Administration, and technical experts in public agencies, private organizations, and academic institutions, is authorized to determine the need to provide support under this Act for a study of the feasibility of transmitting solar energy to Earth by using orbital structures manufactured from lunar or asteroidal materials, and the impact of such a feasibility study, if any, on existing National Science Foundation programs.

(b)(1) If the Foundation determines that such a feasibility study is necessary, the Foundation is authorized to conduct such a study directly or by grants or contracts with public agencies, private organizations, or academic institutions.

(2) At the conclusion of any such study the Foundation shall prepare and submit to the President and to the Congress a report of the study, together with such recommendations as the Foundation deems appropriate.

(3) Of the funds authorized in section 2, $500,000 shall be available to carry out the provisions of this subsection.

Approved October 10, 1978.

LEGISLATIVE HISTORY:

HOUSE REPORT No. 95-993 (Comm. on Science and Technology).
SENATE REPORTS: No. 95-851 accompanying S. 2549 and No. 95-853 (Comm. on Human Resources).
CONGRESSIONAL RECORD, Vol. 124 (1978):
Apr. 18, considered and passed House.
June 28, considered and passed Senate, amended, in lieu of S. 2549.
Sept. 19, House concurred in Senate amendment with an amendment.
Sept. 29, Senate concurred in House amendment.

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FY 1979--Senate Authorization Subcommittee Report (95-851) on its Bill (S. 2549)

NSF Authorization Act, 1979 (PL 95-434) (No Conference Report).

consideration and that the Foundation should advise them of the criteria under which they will be evaluated. The Foundation is requested to report annually to the House Committee on Science and Technology and the Senate Committee on Human Resources on the results of this effort and on the result of the periodic review of present policy recommended by the National Science Board.

The conferees further believe that more information than has been compiled by the Foundation in the past should be acquired to help determine the degree of interest and technical expertise of the industrial community in basic research. Such data should make possible a more accurate assessment of the extent of the desire of industrial researchers to have their proposals considered on the same basis as those submitted by the university-based researchers.

The conferees therefore request the Foundation to compile appropriate information, with particular emphasis on the size of profit-seeking firms whose researchers might be expected to become eligible for support and, insofar as feasible, the contribution to the body of scientific knowledge which might result. The Foundation is requested to report its findings to the House Committee on Science and Technology and the Senate Committee on Human Resources by February 1, 1978.

Section 4(b)—RANN small business set-aside

The Senate bill provided that not less than 12.5 per centum of the amount available for Research Applied to National Needs should be expended to small business concerns. The House bill had no similar provision. The conferees agreed to adopt the Senate provision and express support for the small business innovation program.

Section 4(c)—International cooperative scientific activities

The Senate bill provided that emphasis in International Cooperative Scientific Activities should be placed on bilateral and multilateral research and exchange programs, particularly programs involving Western Europe and neighboring countries in the Western Hemisphere. The House bill had no similar provision. The conferees agreed to adopt the Senate provision with language added requiring coordination with the Office of Science and Technology Policy, the Secretary of State and other appropriate officials.

SECTION 5—SCIENCE AND SOCIETY

The Senate bill contained provisions emphasizing activities of the programs in the Office of Science and Society of the National Science Foundation. The House bill contained no similar provisions. The conferees agreed to adopt certain of the Senate provisions with modifications in some.

In addition, it is the intention of the conferees that in the implementation of its "Science and Society" program the Foundation should give due consideration to such planning grants as may facilitate:

(1) The design and use of registries of scientists and engineers to serve as a resource to local decisionmakers, community and public interest groups, including the study of past and present registries and their effectiveness;

(2) The establishment of at least one regional center to support projects involving public policy issues with significant scientific and

e. For Science for Citizens the budget request was $1,200,000. The House authorized not more than $100,000 and the Senate authorized $5,000,000. The conferees agreed on $1,800,000.

f. For Public Understanding of Science the budget request was $2,600,000. The House recommended, the Senate authorized, and the conferees agreed on that amount.

g. For Ethics and Values in Science and Technology the budget request was $1,400,000. The House recommended, the Senate authorized, and the conferees agreed on that amount.

h. For a comprehensive assessment of science education in two-year colleges there was no request. The House authorized no funds, and the Senate authorized $1,000,000 for a new program. The conferees agreed on $500,000.

i. For Comprehensive Assistance to Undergraduate Science Education the budget request was $14,500,000. The House recommended $17,500,000, and the Senate authorized not more than $100,000. The conferees agreed on $14,500,000.

j. For Precollege Teacher Development the House recommended $1,000,000, and the Senate recommended $7,600,000. The conferees agreed on $6,000,000.

The Senate Bill included a provision directing the Foundation to use not less than 50 percent of funds available for the program Precollege Teacher Development to provide science teachers with training in instructional methods which encourage students to explore the interaction between science and society. The Senate authorized $7.6 million for precollege teacher development. The House authorized $1 million for pre college teacher development, but the House Bill did not include a set aside provision.

The conferees agreed to authorize $6 million for pre college teacher development and to urge the Foundation to use not less than 25 percent of the funds available to train teachers in methods to encourage students to explore the interaction between science and society.

7. For Research Applied to National Needs, the budget request of the National Science Foundation was $78,000,000. The House authorized $72,700,000, and the Senate authorized $79,000,000. The conferees agreed on $77,800,000, including an increase of $500,000 for the support of research on nitrogen fixation.

The House bill included a provision establishing a floor of $23,000,000 and policy direction for "Applied Social Research" and "Policy related Scientific Research" in the program of Research Applied to National Needs. The Senate bill did not provide a floor or specific policy direction for these programs.

Recognizing the importance of these programs, the need to ensure balance in the overall RANN program, plus the uncertainties of appropriations from year to year, the conferees have included in the bill a requirement that not less than 25 percent of available RANN funds be earmarked for "Applied Social Research" and "Policy related Scientific Research" in lieu of a specific amount.

8. For Scientific, Technological, and International Affairs, the budget request of the National Science Foundation was $22,600,000.

JOINT EXPLANATORY STATEMENT OF THE COMMITTEE OF CONFERENCE

The managers on the part of the House and the Senate at the conference on the disagreeing votes of the two Houses on the amendment of the Senate to the bill (H.R. 4991) National Science Foundation Authorization Act, fiscal year 1978, and for other purposes, submit the following joint statement to the House and the Senate in explanation of the effect of the actions agreed upon by the managers and recommended in the accompanying conference report:

The amendment of the Senate struck out all after the enacting clause in the House bill and substituted new language. The committee of conference agreed to accept the Senate amendment with certain amendments and stipulations proposed by the conferees.

The National Science Foundation requested authorization in the amount of $879,000,000 for Fiscal Year 1978, plus $6,000,000 in excess foreign currencies. The House authorized $863,100,000 and $4,900,000 in excess foreign currencies. The respective Senate figures were $894,000,000 and $6,000,000.

The committee of conference recommended $879,350,000, plus $4,900,000 in excess foreign currencies. This total amount of $884,250,000 is $16,250,000 more than authorized by the House and $15,750,000 less than authorized by the Senate for Fiscal Year 1978.

2-YEAR AUTHORIZATION

The Senate bill authorized $1,059,400,000 to be appropriated to the Foundation for fiscal year 1979. Funds were made available for nine program categories. Funding levels and set-asides for certain activities within those categories were specified. The House bill included no similar provisions.

The conferees agreed that a two-year authorization would be useful in establishing a framework for planning that could be of substantial assistance to the Foundation and to the scientific community in the development of programs and policies. They agreed that a two-year authorization could be helpful in assuring full consideration by the appropriations committees of the programs and policies included in the authorization and that a two-year authorization might also be of assistance in enabling the authorizing committees to meet the requirements of the Congressional Budget Act, under which stringent reporting deadlines must be met and projections of budget levels must be submitted.

Nonetheless conferees adopted the view of the Managers on the part of the House that a 2-year authorization would not be acceptable to the House at this time. The major reasons given by House managers were: (1) no record of fiscal year 1979 funding for NSF has been

created when the people most familiar with the research and sensitive to user needs can continue into a utilization phase free of the constraints which result when an immediate effort has to be made to find support for a new project to sustain the organization."

3. Small Business [*Sec. 5(c)*]

The Committee is encouraged by the progress of the Foundation small business program. The first Program Solicitation designed for and limited to small business—"Small Business Innovation Applied to National Needs"—has been made. Although it is a very small beginning, (one million dollars in Phase 1), the Committee believes it to be a most important one. The fact that it permits multiple awards on a generally competitive, but broad basis of technical support is appealing. So is the effort to simplify the application procedures. And what is most attractive is the experimental effort to encourage small business to plan in advance for the use of private venture capital in the event of success, after a second, N.S.F. funded follow on phase. This is the first Federal effort to try to plan for both small business research on subjects of national need, and its subsequent commercial use with maximum private funding.

The Committee believes that his promising effort should receive adequate and continuous Foundation support over an extended period of time. Five full years of support may be needed to provide a sound basis for complete appraisal. It will clearly take at least 24 months for the best small technical companies and the rest of the scientific community to become informed about the new program. We urge most strongly that the Foundation conduct a series of such solicitations—at least one more this more this year and three or four in each of the two succeeding fiscal years. Small business will need to be convinced that this is not just another temporary program. Too often in the past just as the interest of the small business community has been elicited, a program has been abandoned.

To underscore the Committee's support for further experimental development of the small business program in this and other promising ways, the minimum goal for small business' share of RANN awards has been increased from 10 percent to a minimum 12½ percent for the fiscal year 1978, and to a minimum 15 percent for fiscal year 1979. The Committee also expects that the newly designated Office of Small Business Research and Development will work to increase opportunities for qualified small businesses to participate in the work of the rest of the National Science Foundation. RANN is expected to be a principal center for small business support within the Foundation because of its emphasis on applied research. But the other Directorates also should be expanding small business participation in basic research, science education and policy research. Ways to further appropriate joint academic-small business science and technology research ventures should be fully explored.

4. Science Teacher Development [*Sec. 5. (d)*]

S. 555 provides that fifty percent of the funds available for the program "Pre College Teacher Development" is to be used to provide

institutions. A significant reduction in the amount awarded to universities and colleges would have a severe impact on the stability of university science programs.

The Committee recognizes private industry can be a source of important research breakthroughs, and urges greater efforts to develop cooperative research programs among researchers in industrial laboratories and in universities.

To promote the growth and continued productivity of scientific research therefore, the Committee has included language in the bill to encourage equal opportunity for industrial researchers to compete with university-based researchers. Private industry and academic researchers alike should be subject to a standard of excellence based on scientific merit, the technical adequacy of the researcher and his institutional base, criteria relating to utility or relevance, and criteria relating to future and long-term scientific potential. The committee fully supports continued implementation of existing NSF policies which call for cost-sharing and with NSF patent policy which requires that the government receive royalty-free licenses and the right to require licensing of others on reasonable terms.

S. 855 also directs the National Science Foundation to increase support for cooperative research projects involving researchers from the industrial and academic sectors and to make fellowships available to enable academic researchers to spend up to two years in an industrial environment and to allow industrial researchers to spend up to two years in an academic environment.

It is the Committee's view that these programs it has authorized should be carried out under the basic research budget it has recommended—a budget which is 12.4 percent above the fiscal year 1977 level—without imposing any significant restrictions on the availability of basic research support to university-based scientists and engineers.

It is the Committee's view that the National Science Foundation and the Nation can afford this investment. Moreover, it is the Committee's intention to monitor the impact of this change in policy on the strength of the Nation's basic research effort and on colleges and universities whose researchers have made such an outstanding contribution to the advancement of science over the twenty-seven year history of the Foundation. It is not the Committee's intent that this new policy erode the strength of academic scientific research, and the Committee expects the N.S.F. to guard against such erosion. The Committee also recommends that future budgets submitted by the Foundation to the Congress include the funding necessary to ensure that the nation does not overlook the potential for advances in scientific research which exist in the industrial sector.

The Committee particularly recognizes the potential competition between academic and industrial organizations for the services of researchers who have proven themselves successful in obtaining National Science Foundation funding for their research projects. The Committee expects the Foundation to guard against industrial "raiding" of academic research staffs based on an assumption that the Foundation funds automatically will follow the researcher.

The Committee also emphasizes that research funds allocated to industrial-based research should not be used to displace or substitute

Further, an examination of those selected to review research proposals showed that only about 2.5 percent of reviewers were from private profit-seeking organizations. In 1975, for example, the seven disciplinary advisory panels included only 5 private representatives of private, profit-seeking organizations of a total of 84, or about 6 percent. Moreover, National Science Foundation figures show that only 15 percent of the formal National Science Foundation advisors are affiliated with private profit-seeking organizations.

At the request of the Committee in the Report which accompanied the National Science Foundation authorization last year, a Task Force was assembled by National Science Foundation to review the role of scientific research in non-academic institutions with particular attention to National Science Foundation programs and policies relating to private industry. A wide range of industrial and academic experts was consulted, and four major recommendations were made relating to the funding policies of the Foundation. The Task Force recommended that the Foundation:

1. continue to place major emphasis on providing adequate long term support to the most creative research workers;

2. expand the support of cooperative research projects in both basic and applied research among researchers in private profit-seeking industrial laboratories and universities;

3. develop a subbatical or fellowship program to allow faculty members to spend one or two years working in an industrial environment and industrial research workers to work in a university for similar lengths of time;

4. allow researchers in industry to compete on an equal basis with researchers for basic research funds.

The Task Force explanation of the intent of recommendation number 4 indicates a departure from the current NSF policy established and followed by the National Science Board since the 1960's.

The Task Force report states:

> This recommendation proposes opening to the profit-making sector the competition for basic research funds under the same criteria as those required of the academic community. The special criteria which currently must be met by unsolicited proposals for support of basic research by industrial organizations are:
>
> (a) The project is of special concern from a national point of view and shows promise of solving an important scientific problem;
>
> (b) Unique resources are available in industry for the work; or
>
> (c) The project proposed is outstandingly metritorious.
>
> Implementation of this recommendation requires only that the above criteria be deleted.
>
> It should be noted that the criteria for selection of basic research projects are those established by the NSB for Scientific Research Project Support. The primary emphasis is "overwhelmingly upon the criteria of intrinsic scientific merit." Opening the competition to researchers from profit-

Science Education Development and Research ($9.2 million for fiscal year 1978; $8.2 million for fiscal year 1979): This program encourages the advancement of our knowledge of how scientific concepts, processes and skills are learned. The program also encourages the development of means by which the quality and relevance of the learning processes in science can be improved.

For fiscal year 1978, S. 855 authorizes $1 million to be used for a comprehensive assessment of science education in two-year colleges, as described in Part III E of this report.

S. 855 provides a minimum of $1.2 million for the Continuing Education for Scientists and Engineers program for fiscal year 1978. This funding level will allow the program to stimulate the development of new methods of providing career scientists and engineers with up-to-date information that they need to function more effectively.

Science and Society ($9 million for fiscal year 1978; $10.75 million for fiscal year 1979): The objectives of this program are to improve public understanding of science and technology; to improve public understanding of public policy issues involving science and technology; to increase the public understanding of the role of science and technology in meeting national needs; and to focus on the ethical values in science and technology. The program is designed to increase both the amount and quality of communication between the scientific community and the public, and to increase the use of science by the public. This program will include awards and planning grants in accordance with the provisions in Sec. 6(b) and Sec. 8(c) of S. 855.

S. 855 places floors of $2.6 million for fiscal year 1978 and $3 million for fiscal year 1979 under the Public Understanding of Science program. The program will emphasize the improvement of techniques for distributing and disseminating information to nonscientists about science and technology and its relevance to public policy. The increase in funding level will provide additional support to improve the scope, level, and quality of information about science and technology addressed to the general public.

Floors of $1.4 million for fiscal year 1978 and $2 million for fiscal year 1979 are established for the Ethics and Values in Science and Technology (EVIST) program. EVIST will focus on the ethical issues and problems which arise in the conduct of science and technology including those encountered by scientists and engineers in their professional capacities.

S. 855 places floors of $5.0 million for fiscal year 1978 and $5.75 million for fiscal year 1979 under the Science for Citizens program. Emphases of this program will include: the continuation of Public Service Science Residencies for professional scientists and engineers; and Public Service Internships for undergraduate and graduate students of science and engineering. The scientists and engineers will work on public policy issues with significant scientific and technical components in conjunction with public interest groups, units of State and local government, or nonprofit media organizations. Direct assistance to public interest groups is authorized, as well as other activities specified in Sec. 6 of S. 855.

Calendar No. 74

95TH CONGRESS
1st Session

SENATE

REPORT
No. 95-93

NATIONAL SCIENCE FOUNDATION AUTHORIZATION ACT OF 1978

APRIL 18 (legislative day, FEBRUARY 21), 1977.—Ordered to be printed

Mr. KENNEDY, from the Committee on Human Resources, submitted the following

REPORT

together with

MINORITY VIEWS

(To accompany S. 855)

The Committee on Human Resources, to which was referred the bill (S. 855) to authorize appropriations for the activities of the National Science Foundation, and for other purposes, having considered the same, reports favorably thereon with an amendment and recommends that the bill as amended do pass.

I. INTRODUCTION

A. CHRONOLOGY OF THE NATIONAL SCIENCE FOUNDATION AUTHORIZATION ACT OF 1978

The following bills authorizing appropriations for the National Science Foundation were considered by the Committee: S. 855, introduced by Senator Kennedy on March 2, 1977; and H.R. 4991, passed by the House of Representatives and referred to the Committee on March 25, 1977.

Hearings were held on March first and third by the Subcommittee on Health and Scientific Research.

The following officials of the National Science Foundation testified: Dr. Richard C. Atkinson, Acting Director, National Science Foundation.

of the House of Representatives and the Committee on Labor and Public Welfare of the Senate on the results of activities including an evaluation and assessment of the entire program carried out under this subsection, not later than March 1, 1977.

OFFICE OF SMALL BUSINESS RESEARCH AND DEVELOPMENT

Establishment. 42 USC 1883.

SEC. 8. The National Science Foundation is authorized and directed to establish an Office of Small Business Research and Development. The Foundation through the Office of Small Business Research and Development and in cooperation and consultation with the Small Business Administration shall—

(1) foster communication between the National Science Foundation and the small business community, and insure that the set-aside for small business concerns provided under this Act or any other Act authorizing appropriations for the National Science Foundation is fully and effectively utilized;

(2) collect, analyze, compile, and publish information concerning grants and contracts awarded to small business concerns by the Foundation, and the procedures for handling proposals submitted by small business concerns;

(3) assist individual small business concerns in obtaining information regarding programs, policies, and procedures of the Foundation, and assure the expeditious processing of proposals by small business concerns based on scientific and technical merit;

(4) recommend to the Director and to the National Science Board such changes in the procedures and practices of the Foundation as may be required to enable the Foundation to draw fully on the resources of the small business research and development community; and

(5) make quarterly reports to the Congress concerning the activities of the Office of Small Business Research and Development.

Quarterly reports to Congress.

NATIONAL SCIENCE BOARD

SEC. 9. (a) Section 4 of the National Science Foundation Act of 1950 is amended by inserting before the period at the end of subsection (a) a comma and the following: "within the framework of applicable national policies as set forth by the President and the Congress".

Ante, p. 473. 42 USC 1863.

(b) Section 4(g) of such Act as redesignated by this section is amended—

(1) by inserting after "the Director," the following: "after consultation with the Chairman of the Board"; and

(2) by striking out "GS–15" and inserting in lieu thereof "GS–18".

LIMITATION

Appropriation authorization.

SEC. 10. (a) In addition to such sums as are authorized by section 2, not to exceed $6,000,000 is authorized to be appropriated for fiscal year 1977, for expenses of the National Science Foundation incurred outside the United States to be paid for in foreign currencies which the Treasury Department determines to be excess to the normal requirements of the United States.

(b) Appropriations made pursuant to this Act may be used, but not to exceed $5,000 for official consultation, representation, or other extraordinary expenses upon the approval or authority of the Director of the National Science Foundation, and his determination shall be final and conclusive upon the accounting officers of the Government.

Public Law 94-471
94th Congress

An Act

Authorizing appropriations to the National Science Foundation for fiscal year 1977.

Oct. 11, 1976
[H.R. 12566]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "National Science Foundation Authorization Act, 1977."

National Science Foundation Authorization Act, 1977.
42 USC 1861 note.

AUTHORIZATION FOR ACTIVITIES OF THE NATIONAL SCIENCE FOUNDATION

SEC. 2. (a) There is authorized to be appropriated to the National Science Foundation for the fiscal year 1977, for the following categories:

(1) Mathematical and Physical Sciences and Engineering, $231,525,000.

(2) Astronomical, Atmospheric, Earth and Ocean Sciences, $244,850,000.

(3) Biological, Behavioral, and Social Sciences, $180,425,000.

(4) Science Education Programs, $69,400,000.

(5) Research Applied to National Needs, $69,000,000.

(6) Scientific, Technological, and International Affairs, $22,000,000.

(7) Program Development and Management, $43,500,000.

(b) The National Science Foundation shall recommend and encourage the pursuit of national policies designed to foster research and education in science and engineering, and the application of scientific and technical knowledge to the solution of national and international problems.

(c) The National Science Foundation is authorized and directed to provide assistance to the Office of Science and Technology Policy established by the "Presidential Science and Technology Advisory Organization Act of 1976" (42 U.S.C. 6611).

Ante, p. 463.

(d) Notwithstanding any other provision of this or any other Act not less than 10 per centum of the amount authorized for category (5) of subsection (a) of this section shall be expended to small business concerns.

(e)(1) The National Science Foundation shall establish uniform procedures for establishing the responsibility for material published with the assistance of or under the sponsorship of the Foundation. The Foundation shall also establish procedures for reporting on the utilization of research projects assisted under the program "Research Applied to National Needs".

(2) The National Science Foundation shall arrange for the dissemination of all substantive technical reports through the National Technical Information Service of the Department of Commerce.

(3) In the conduct of the energy research and development activities under the "Research Applied to National Needs" category, the National Science Foundation shall coordinate all new energy research project awards with the Administrator of the Energy Research and Development Administration or his designee.

42 USC 5820 note.

(f) The Director of the National Science Foundation is authorized and directed to conduct a feasibility study of operating the peer review system used in the evaluation of grant proposals within the Founda-

42 USC 1864 note.

of information on the employment and availability of scientific, engineering and technical manpower and an assessment of the extent to which a federally-supported continuing education program could alleviate unemployment and underemployment among scientists and engineers and lead to the greater application of their skills to the solution of the problems the Nation is facing in areas of civilian science and technology.

SECTION 7—MINORITIES, WOMEN, AND HANDICAPPED INDIVIDUALS

The Senate bill included a number of provisions relating to the underrepresentation of minorities, women and handicapped individuals in science and engineering. Several of these provisions were not included in the House bill.

The conferees agreed to adopt the Senate provisions directing the Foundation to initiate an intensive search for qualified women, minorities and handicapped individuals to fill executive level positions at the Foundation, and to improve the representation of minorities, women and handicapped individuals on advisory committees, review panels and all other means by which the scientific community provides assistance to the Foundation. The Foundation is also directed to report quarterly on these activities—a report which the conferees recommend be included as part of the quarterly reporting system already established by the Foundation.

The conferees also approved the authorization of $2,500,000 for a program "Minorities, Women, and Handicapped Individuals in Science" for experimental forums, conferences, workshops and other activities designed to improve scientific literacy and to encourage and assist minorities, women and handicapped individuals to undertake and to advance in careers in scientific research and science education. For the continuation of the program "Minority Institutions Improvement" $5,000,000 was approved.

The conferees also agreed to authorize $1,000,000 for planning and study grants for programs including, but not limited to, Minority Centers for Graduate Education in Science and Engineering. Criteria for the award of grants under this program are to be established in consultation with groups which have been active in seeking greater recognition of the scientific and technical capabilities of minorities. An evaluation and assessment of these activities is to be submitted to the Foundation not later than March 1, 1977.

Recognizing the care and thoughtful planning which must go into this new program if it is to be effective and the importance of the report which will be presented to the Congress on the results of the program, the conferees strongly urge the Director of the Foundation to appoint an Advisory Committee, including minority scientists, to participate in the evaluation and assessment of these activities.

SECTION 8—OFFICE OF SMALL BUSINESS RESEARCH AND DEVELOPMENT

The Senate bill included a section directing the National Science Foundation to establish within the Office of Government and Public Programs an Office of Small Business Research and delineating its responsibilities. The House bill included no comparable provision.

94TH CONGRESS 2d Session } HOUSE OF REPRESENTATIVES { REPORT No. 94-1689

NSF AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1977

SEPTEMBER 27, 1976.—Ordered to be printed

Mr. TEAGUE, from the committee of conference, submitted the following

CONFERENCE REPORT

[To accompany H.R. 12566]

The committee of conference on the disagreeing votes of the two Houses on the amendment of the Senate to the bill H.R. 12566 authorizing appropriations to the National Science Foundation for fiscal year 1977, having met, after full and free conference, have agreed to recommend and do recommend to their respective Houses as follows:

That the House recede from its disagreement to the amendment of the Senate and agree to the same with an amendment as follows:

In lieu of the matter proposed to be inserted by the Senate amendment insert the following:

That this Act may be cited as the "National Science Foundation Authorization Act, 1977."

AUTHORIZATION FOR ACTIVITIES OF THE NATIONAL SCIENCE FOUNDATION

SEC. 2. (a) There is authorized to be appropriated to the National Science Foundation for the fiscal year 1977, for the following categories:

(1) Mathematical and Physical Sciences and Engineering, $231,525,000.

(2) Astronomical, Atmospheric, Earth and Ocean Sciences, $241,850,000.

(3) Biological, Behavioral, and Social Sciences, $130,425,090.

(4) Science Education Programs, $69,400,000.

(5) Research Applied to National Needs, $69,000,000.

(6) Scientific, Technological, and International Affairs, $22,000,000.

(7) Program Development and Management, $43,500,000.

(b) The National Science Foundation shall recommend and encourage the pursuit of national policies designed to foster research and education in science and engineering, and the application of

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technologists, to promote international cooperation in science and technology to assist in solving problems such as world food and population problems and to insure coordination of these programs with programs of other federal agencies.

Subsection (b). This subsection directs the Foundation, in cooperation with certain other agencies to study international scientific research, education and policy analysis and report to the House and Senate oversight committees by March.

Section 202. This section directs the Foundation to encourage and promote interdisciplinary research through interdisciplinary undergraduate programs, research projects which provide for apprenticeship training, fellowship programs and arrangements for degree training including post-graduate degrees in more than one discipline in institutions of higher education.

Section 203. This section authorizes and directs the Foundation to conduct a "Science for Citizens Program" to (1) improve public understanding of public policy issues involving science and technology. (2) Facilitate the participation of scientists, engineers and graduate and undergraduate students in public activities aimed at the resolution of public policy issues having significant scientific and technology aspects, and (3) enable groups to acquire necessary technical expertise in dealing with the scientific and technical aspects of public policy. (b) This subsection requires that review panels established to evaluate proposals under this section shall have balanced membership from the scientific and non-scientific community and the public and private sectors.

The sum of $3 million is earmarked for this program, and an augmented Public Understanding of Science Program.

Section 204. This section directs the Foundation to initiate a program of continuing education in science and engineering to enable experienced scientists and engineers to render more valuable contributions to the nation.

Subsection (b). This subsection requires that the program shall include the development of special curricula and educational techniques and the award of fellowships.

Subsection (d). This subsection authorizes the Foundation to allocate followships under this section in such a manner as to attract highly qualified applicants and provide an equitable distribution of such fellowships throughout the United States.

The sum of $1 million is earmarked for this program.

Section 205(a). This subsection directs the Foundation to intensify its search for qualified women, minorities and handicapped individuals to fill executive level positions in the Foundation and to increase the numbers of women, minorities and the handicapped on advisory committees and panels of the Foundation and report quarterly to the Congress.

Subsection (b). This subsection provides that notwithstanding any other provision of this or any other Act, $5 million shall be available for the program "Minority Institutions Improvement" and $2.5 million for a Program "Minorities, Women, and Handicapped Individuals in Science" for experimental forums or other activities designed to improve scientific literacy and to encourage and assist minorities, women, and handicapped individuals to enter the sciences.

Future Patterns for National Science Foundation Support for Basic and Applied Research

The Administration request for basic research programs in FY 77 represents a 19.5% increase over FY 76, reflecting an awareness of the important role which such research must play in furthering the Nation's economic and social goals. The Committee concurs with the Administration proposal, and has approved the increase requested.

The Committee feels that there are two distinct justifications for the public funding of research in the sciences. One is that such work should be supported on the general principle that knowledge is better than ignorance. An example of how such knowledge, fundamentally motivated by simple curiosity, may be of benefit to the society is provided by the recent discovery of a possible link between terrestrial uses of the gas Freon, and the depletion of ozone in the stratosphere.

The second justification for the support of basic research is that such research ultimately may be applied in the marketplace, or in the solution of social problems, and result in new goods or services of benefit to the taxpayer. This innovative process, which involves the transformation of science into technology, has not traditionally received much attention, and in the past seems to have relied rather heavily on serendipity for success.

The Committee notes with concern the recent accumulation of evidence that the Nation is apparently falling behind the rest of the world in technological innovation. According to the report "Science Indicators 1974", published by the National Science Foundation, the U.S. has shown a sharp decline in its "balance of patents" with other technological countries over the past several years. Of even greater concern, perhaps, is the long term decline of the proportion of innovations which were characterized as "radical breakthroughs", which was attributed to reductions in the number of such innovations from the most R&D-intensive industries. The Department of Commerce has pointed out recently that the percentage of foreign patents taken out in a number of technologically innovative fields is alarmingly high.

The same National Science Foundation Report also points up another long term trend which is of concern to the Committee. This is the recent lack of growth in science departments at the Nation's colleges and universities. Having experienced an explosive growth rate during the Sixties, these departments now typically consist of relatively young faculties, with high teacher-student ratios, and almost no prospect for expansion. Not surprisingly, the fraction of the faculty members holding tenure in these science departments has also been steadily increasing, reaching 70% by 1974. This means that the pattern of the Sixties, in which recent science graduates turned naturally to academic careers, has shifted markedly, and the younger scientists are no longer making careers at universities. Accurate statistics describing this demographic shift appear to be lacking, but it seems likely that many recent science graduates are moving to industrial positions, and that this is a trend which is likely to continue.

If this is so, it may provide significant impetus toward solving the problem of technological innovation described above. For if the recent graduates in science are indeed pursuing careers in industry, then—to the extent that they are employed in research and development—they

The Foundation is also directed, in collaboration with the Small Business Administration and private sector organizations representing small business, to prepare a comprehensive report on the scientific and technical capability which exists in the small business community.

The Committee expects the Office of Small Business Research and Development to serve as an effective nerve center within the Foundation for the coordination and implementation of Foundation policies and procedures as they apply to small research and development firms. The Committee feels strongly that these companies constitute in the aggregate a valuable national resource which is not being fully utilized at present. The Foundation can and should play an important role in helping this sector of the economy realize its full potential.

The Committee carefully considered its decision to place the Office of Small Business Research and Development within the Office of Government and Public Programs, rather than within a particular Research Directorate. The full extent and nature of small business involvement with the Foundation over the next few years cannot be predicted at this time and for this reason the Committee feels that the Office must have a position within the organizational structure of the Foundation which will give it a broad overview of the full range of Foundation activities.

The Committee expects that the quarterly reports required by this section will be included as part of the Foundation's regular quarterly reporting to the Congress.

7. STATE SCIENCE, ENGINEERING, AND TECHNOLOGY PROGRAMS

In the 93rd and 94th Congresses, the Senate passed, as part of S. 32, provisions to authorize funding in order to strengthen mechanisms for providing scientific advice to State governments. The Senate in passing this legislation recognized the need of the States to further develop their capacities to respond in an informed manner to the increasingly technical issues with which they are daily confronted.

In the conference on H.R. 10230 (S. 32), the National Science and Technology Policy, Organization, and Priorities Act of 1976, the Conferees strongly endorsed the need for such a program, but determined that the National Science Foundation authorization legislation was perhaps a more appropriate vehicle through which to institute this program. The Statement of Managers filed with the Conference Report on H.R. 10230 (S. 32) stated:

> At the same time the Conferees agreed to express their unanimous conviction (1) of the soundness of the concept that State and local governments would profit from their own science advisory system; (2) that such systems could be made more effective through appropriate liaison with the Federal Government; and (3) that greater cooperation and improved financial arrangements between the States and localities in the National Science Foundation are in order, including adequate additional financial support of programs designed to increase the States' capacity for wise application of science and technology for State and local needs.

Manuel P. Berriozabal, Professor of Mathematics, University of New Orleans; New Orleans, Louisiana

Press L. Robinson, Democratic State Central Committeeman and Professor of Chemistry, Department of Chemistry; Southern University; Baton Rouge, Louisiana

James H. Porter, Associate Professor of Chemical Engineering, Massachusetts Institute of Technology, Department of Chemical Engineering; Cambridge, Massachusetts

Antonio A. Sandoval, Professor, Department of Chemistry, College of Arts and Sciences, University of Missouri; Kansas City, Missouri

William E. Davis, President, The University of New Mexico; Albuquerque, New Mexico

Leonard M. Napolitano, Dean, School of Medicine; Interim Vice President for Health Sciences, The University of New Mexico; Albuquerque, New Mexico

Gilbert Sanchez, Head, Biology Department, New Mexico Institute of Mining and Technology; Socorro, New Mexico

Betty W. Harris, Los Alamos, New Mexico

Samuel von Winbush, Professor and Chairman of Department of Chemistry, College at Old Westbury, State University of New York; Long Island, New York

Hubert M. Winston, Assistant Professor, Department of Chemical Engineering, School of Engineering, North Carolina State University; Raleigh, North Carolina

Thomas Davis, Bartlesville, Oklahoma

Milton J. Hernandez, Assistant Professor of Medicine and Physiology, Department of Medicine/Neurology Division, The Milton S. Hershey Medical Center, The Pennsylvania State University; Hershey, Pennsylvania

Ernest D. Marquez, Assistant Professor, Department of Microbiology, College of Medicine, The Milton S. Hershey Medical Center, The Pennsylvania State University; Hershey, Pennsylvania

Eppie Rael, Assistant Professor, Department of Biology, University of Texas; El Paso, Texas

Rodhney R. Rodriquez, Graduate Student, University of California at Berkeley, Department of Physiology-Anatomy, El Paso, Texas

William A. Gulliory, Chairman/President, National Organization for the Professional Advancement of Black Chemists and Chemical Engineers, University of Utah; Salt Lake City, Utah

Manual Gonzales, LULAC National President, League of United Latin American Citizens; Washington, D.C.

M. Carl Holman, President, The National Urban Coalition, Washington, D.C.

Eduardo Terrones, Chairman, American G I Forum of Washington, D.C.

Ernest G. Uribe, Associate Professor of Botany and Biochemistry, Washington State University; Pullman, Washington

James E. Cheek, President, Howard University; Washington, D.C.

Glenn Terrell, President, Washington State University, Pullman, Washington

Bernard Ortiz de Montellano, Coordinator, Minority Academic Affairs, College of Arts and Sciences, The University of Wyoming; Laramie, Wyoming

Calendar No. 844

94TH CONGRESS 2d Session | SENATE | REPORT No. 94-888

NATIONAL SCIENCE FOUNDATION AUTHORIZATION ACT, 1977

MAY 14, 1976.—Ordered to be printed under authority of the order of the Senate of May 13, 1976

Mr. KENNEDY, from the Committee on Labor and Public Welfare, submitted the following

REPORT

[To accompany S. 3202]

The Committee on Labor and Public Welfare, to which was referred the bill (S. 3202) to authorize appropriations for activities of the National Science Foundation for fiscal year 1977, and for other purposes, having considered the same, reports favorably thereon with an amendment and recommends that the bill as amended do pass.

I. Introduction

A. CHRONOLOGY OF THE NATIONAL SCIENCE FOUNDATION AUTHORIZATION ACT, 1977

The following bills authorizing appropriations for the National Science Foundation were considered by the Committee: S. 3202, introduced by Senator Kennedy on March 24, 1976 for himself and Senators Pell and Mondale; S. 3068, introduced by Senator Javits on March 2, 1976; and H.R. 12566, passed by the House of Representatives and referred to the Committee on March 29, 1976.

Hearings were held on March first and third by the Special Subcommittee on the National Science Foundation.

The following officials of the National Science Foundation testified:
H. Guyford Stever, Director
Norman Hackerman, Chairman, National Science Board
Richard C. Atkinson, Deputy Director
Harvey A. Averch, Acting Assistant Director for Science Education
Eloise E. Clark, Acting Assistant Director for Biological, Behavioral, and Social Sciences.

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State, and local government levels. Such funds shall not be available for use with respect to any program or activity if such use would result in a substantial duplication of any program or activity which is receiving other Federal financial assistance. Such funds may be used to identify, analyze, and contribute knowledge to improve productivity in the public sector; identify, analyze, and evaluate more effective, efficient, and equitable ways to deliver human services; and develop the data base and analytical techniques required for improving applied research on municipal systems and human service delivery;

(10) of the total amount authorized under section 1, category (4), not less than $1,000,000 shall be available for the purpose of "Fire Research." The transfer of this program to the Fire Research Center of the National Bureau of Standards (15 U.S.C. 278 f.) during the fiscal year ending June 30, 1976, is authorized;

(11) of the total amount authorized under section 1, category (4), not less than 7.5 per centum of such amount shall be expended to small business concerns;

(12) of the total amount authorized under section 1, category (6), not less than $7,000,000 shall be available for "Ethnic Minorities and Women in Science Program"; and not less than $1,500,000 thereof shall be available to develop and test methods of increasing the flow of women into careers in science;

(13) of the total amount authorized under section 1, category (10), not less than $8,000,000 shall be available for the "Intergovernmental Science Program";

(14) of the total amount authorized under section 1, category (11), not less than $1,500,000 shall be available for programs related to the ethical and human value implications of science and technology; and

(15) the amount of $5,500,000 for "Institutional Improvement for Science" which was authorized and appropriated to the National Science Foundation for the fiscal year ending June 30, 1975, and which remains unobligated as of the close of the fiscal year ending June 30, 1975, shall be merged with and added to the amount authorized under section 1, category (6) ("Science Education Support"), of this Act.

42 USC 1869a.

(b) After the date of enactment of this Act the Director of the National Science Foundation, shall require, as a condition of any award made by the National Science Foundation for the purpose of precollege science curriculum development activities, that the awardee, and any subcontractors involved in the distribution, marketing, or selling of such science curricula, shall include in any testing agreement, sales contract, or other comparable legal instrument a provision requiring that all instructional materials, including teacher's manuals, films, tapes, or other supplementary instructional materials developed or provided under such award, subcontract, or other legal instrument, will be made available within the school district using such materials for inspection by parents or guardians of children engaged in educational programs or projects of that school district. In addition, the Director of the National Science Foundation shall take such action as may be necessary and feasible to modify awards made for the purpose of precollege science curriculum development and implementation activities on or before the date of enactment of this Act to include such a provision in all possible cases.

The Committee of Conference concluded that this provision confirms the principle parental access, at the local level to teaching materials used by their children. To insure that the provision will be most useful in practice the section was rewritten in a manner that will insure the incorporation of an appropriate clause in all future awards. For awards made in the past the NSF Director is requested to include the appropriate clause to the maximum possible extent.

Section 2(c) Graduate and Postgraduate Training and Research

The conferees agreed that graduate and postgraduate training and research programs at educational institutions require continued assistance from the Foundation. Concern was expressed, however, that in the past such assistance, under the Institutional Improvement for Science program was based on formula grants rather than on a demonstration of need, and that institutions were not required to submit, prior to the award of a grant, a statement of the purposes for which the grant would be used.

The program of Research Initiation And Support (RIAS) is designed to meet those concerns and to make available to educational institutions funds to support exploratory research by young scientists, and for the acquisition of instruments, equipment and facilities for research and training. Funding under RIAS will also be available for programs and activities to meet departmental, inter-departmental, and institution-wide training and research needs, or for a combination thereof.

A minimum obligation level of $5,000,000 for RIAS is included in the bill, and the conferees expect that carryover funds available for Science Education Support will be used to fund this program, and that grants will be awarded on a competitive basis.

Section 2(d) Undergraduate Science Program (CAUSE)

The House bill includes a section which would establish a new Comprehensive Assistance to Undergraduate Education (CAUSE) program. The Senate bill included no comparable provision.

The Committee of Conference reviewed the purpose of this program and its potential role within the over-all NSF science education program. CAUSE was proposed in an effort to strengthen undergraduate science education and is intended to incorporate the best features of the highly successful College Science Improvement (COSIP) program conducted by the NSF. Both on its merit and as part of the compromise on the grant review provision the Committee of Conference concluded that CAUSE should be included in the proposed bill. However, the minimum obligation level was reduced from $18.0 million to $15.0 million. The separate minimum obligation level of $3.5 million for two-year institutions was retained.

Section 2(e) Definitions

The House bill included a section defining the scope of the two new line items "Science Education Innovation" and "Science Education Support". The Senate bill did not include a corresponding provision.

The Committee of Conference, having accepted the division of the former "Science Education Improvement" line item into these two new line items, recommends the incorporation of these two definitions into the bill.

Science Education Support. No funds are recommended by the conferees for Institutional Support.

7. For Graduate Student Support the Foundation requested $14,800,000. The House authorized $15,800,000 and the Senate authorized $17,000,000. The conferees agreed on $16,400,000.

8. For Science Information Activities the Foundation requested $6,000,000. The House authorized $6,200,000 and the Senate authorized $7,000,000. The conferees agreed on $6,600,000.

9. For International Cooperative Activities the House, the Senate and the conferees approved the Foundation request for $8,000,000.

10. For Intergovernmental Science and R&D Incentives the Foundation requested $3,000,000. The House authorized $8,000,000 and the Senate authorized $12,000,000. The conferees agreed on $10,000,000.

11. For National R&D Assessment, Planning and Policy Studies, Science Advisory Activities, and Ethical and Human Value Implications of Science and Technology the Foundation requested $9,600,000. The House approved $9,200,000 for Science Assessment, Policy and Advisory Activities and $400,000 for Ethical and Human Value Implications of Science and Technology. The Senate approved the budget request and an additional $1,500,000 for Ethical and Human Value Implications of Science and Technology. The conferees agreed on $11,100,000 for Science Assessment, Policy and Advisory Activities, including the additional $1,500,000 for Ethical and Human Value Implications of Science and Technology.

12. For Program Development and Management, the House, the Senate, and the conferees approved the Foundation request for $41,700,000.

Section 2—Funding Levels and Programs

Section 2(a)—Obligation Minima

The bill as passed by the House included minimum obligation levels for the following program activities:

(1) Science Education Innovation, $39,800,000.

(2) Science Education Support, $34,700,000, which included five sub-floor limitations. The latter were $3,000,000 for Undergraduate Research Participation, $2,500,000 for Secondary School Student Science Projects, and $2,000,000 for Science Faculty Fellowships, and $18,000,000 for CAUSE (including $3,500,000 for two-year institutions).

(3) Graduate Student Support, $15,800,000.

(4) Intergovernmental Science Program, $6,000,000.

(5) Research Applied to National Needs, $23,000,000 for Applied Social Research and for Policy Sciences Research; and $1,000,000 for Fire Research.

The Senate included minimum obligation levels for the following:

(1) Institutional Improvement for Science, $15,000,000.

(2) Science Education Improvement, $70,000,000, which included two sub-floor limitations. The latter were $9,600,000 for Ethnic Minorities and Women in Science and $21,900,000 for Elementary and Secondary School Programs.

(3) Intergovernmental Science Program, $10,000,000.

information should be looked at as a national resource and be utilized to its fullest effective potential.

In the United States, the National Science Foundation is the only Federal agency which has supported systematic development of information services and coordination of those services across the full range of U.S. national interests. The proposed fiscal year 1976 budget for the Office of Science Information Services, while larger than the budget for fiscal year 1975, is still less than 75 percent of fiscal year 1974 expenditures and is less than adequate to meet perceived national needs.

Therefore, the Committee approved $7 million for this item, an increase of $2 million over the Administration request. The Committee also placed a floor under this $7 million authorization.

Research applied to national needs

The budget request submitted by the Administration included $71.5 million for Research Applied to National Needs.

This program focuses U.S. scientific and technical resources on selected problems of national importance for the purpose of contributing to timely, practical solutions. It serves as a bridge between the Foundation's basic research programs and the development, demonstration and operational programs of federal agencies, State and local governments, and industry.

Urgent problems are being addressed by this program, notably in the fields of energy, environment and productivity. Each of these issues figures prominently in the continued well-being and strength of the Nation. The Committee expects the program, following the transfer of a major portion of its solar and geothermal energy research to the Energy Research and Development Administration, to focus on advanced energy concepts—those of high risk but with significant, long range future potential.

To provide an improved scientific base for managing and protecting our environment, both natural and man-made, the Committee has proved an increase of $1 million over the budget request for this program. It has placed a floor of $25 million under environmental programs, which includes $5.5 million for earthquake engineering.

The Committee has also included a provision requiring that at least ten percent of the funds available for Research Applied to National Needs must be awarded to small businesses which have developed outstanding scientific and technical capabilities and which have too often been overlooked as a resource in meeting this Nation's scientific and technical needs.

The Committee approved $81 million for Research Applied to National Needs, an increase of $9.5 million over the budget request.

Intergovernmental science and research utilization

The budget request submitted by the Administration included $3 million for Intergovernmental Science and Research Utilization.

This program is a comprehensive effort designed to increase scientific capability and the utilization of science and technology in the public and private sectors. A survey of the extent of the Federal commitment to fostering applications of its research programs conducted by the National Academy of Engineering, found that while billions are being spent on research itself, a total of only $43 million is being spent by the Federal Government in applying the results of research generated by that support.

the Committee on Labor and Public Welfare of the Senate a written report containing a full and complete statement concerning the nature of the transfer and the reason thereof, or

(B) each such committee before the expiration of such period has transmitted to the Director written notice to the effect that such committee has no objection to the proposed action.

SEC. 10. Notwithstanding any other provision of this or any other Act, the Director of the National Science Foundation shall keep the Committee on Science and Technology of the House of Representatives and the Committee on Labor and Public Welfare of the Senate fully and currently informed with respect to all of the activities of the National Science Foundation.

SEC. 11. This Act may be cited as the "National Science Foundation Authorization Act, 1976".

FY 1976--Senate Authorization Subcommittee Report (94-111) on its Bill (S-1539)

NSF Authorization Act, 1976 (PL 94-86) & Conference Report (S. 94-339)

In 1978 we are estimating, on a reduced overall budget for the Applied Research Directorate, of about 76 awards totaling something over $6.8 million, almost $6.9 million.

In terms of percentage, the amount going to small business has ranged from about seven-tenths of 1 percent, was the low mark in 1972. At the current estimate, we will be putting in about 12.5 percent for this year.

Mr. SPIRA. You need not do this now, but if you would also put in the overall amount for the applied research, we would appreciate it.

Dr. SANDERSON. We will make that one of the columns in the table we provide.

Mr. SPIRA. Without objection, so ordered.

[Material to be supplied follows:]

The thought I would like to encourage is this: What we really need are a lot more experimentation with new and further approaches to try to capitalize on that small business entrepreneurial capability which worked so well for the 200 years when we were primarily a domestic internal company and to use that same creative capability in the international markets where we are now forced to compete.

Representative BRECKINRIDGE. We have a witness sitting in the room who is nodding his head every time you utter a sentence. I am overwhelmed and impressed with that kind of lobbying.

I am in the "Amen" corner also. You described the period of my lifetime. In effect, you have said that we are about where the British Empire was at the end of World War II, not where the Japanese, Germans, Italians, and French were, because we had destroyed their industry. I just hope that the lesson will not have to be learned again by following the course they followed.

What I am suggesting is what you are suggesting, that is, we proceed with all due caution and haste.

Dr. SANDERSON. And flexibility.

Representative BRECKINRIDGE. Yes, flexibility, and careful development. I am suggesting that the horizons be widened and the funding be priced out on a realistic basis with the decisions of others and not taken within the fiscal contraints that are, of necessity, imposed by the system and imposed from above.

I am also saying that if we can turn this system of ours around internally under an administration which has recognized this need and and the importance of this sector by the creation of this 28 agency task force, then we can bring into focus the things that these hearings are developing, program-by-program and industry-by-industry.

Also, if we do not lose our perspective in the process, then we are about to revitalize ourselves.

Conversely, if we all travel down the road with the currently imposed blinders, we are not going to go any farther than we have to this date.

I guess we can all argue about how much time the West has left. I happen to think it is a short fuse. I think that we have an awful lot to accomplish in a very, very short period of time.

Let me ask this question which is a matter of personal opinion.

In your opinion is small business permitted to, or does it, compete equally in all NSF applied research programs, or are there unintential blocks by way of the conception of the program, the funding of it, and the nature of it or something like that?

Dr. SANDERSON. In the applied research area, in my directorate, we certainly have made every effort possible to make sure that they compete on an equitable basis for all of our programs.

The small business set-aside, which is targeted at 12.5 percent for fiscal year 1978, does provide an incentive for the program officers to move actively ahead. We have been working hard to communicate understanding about our programs and to make sure that small business does have the chance to compete.

At present, in my directorate, I know of no institutional barriers or philosophical barriers that would cause difficulties in competition.

Representative BRECKINRIDGE. That is applied research?

Then invite the Office of Management and Budget's attention, as witness the Rabinow report, and invite the White House's attention and then invite the Congress attention.

I think it is apparent from the testimony that we have received to date that the most vital, most vibrant, the most explosive, and the most potential resource available in the nation is sitting quietly on the side in the form of some 10 million small businesses.

These are unconnected with the sources and resources, financial and scientific and technological in the way of initiative and coordination and support.

They are available if we make them available to them in a well-conceived and coordinated basis which builds into it the kind of careful, cautious, and conservative quality type program that you are talking about in all of the interested agencies.

My point is this: In that context, go back to your drawing boards and say what you want to this morning, but go back to your drawing boards and give us what I would consider a realistic program. Let us fight over the dollar limitations and the staff indications that those dollar limitations impose. Let us not try to do everything tomorrow, but let us do it on an orderly and constructive basis.

And the question is this:

Since small business—again at congressional initiative by way of set-aside legislation—receives between 23 percent and 26 percent of the Federal procurement funds, and since they do more than half the innovative development, which is at a 2.6-percent higher rate of efficiency, then why do we not try a comparable technique here?

We did this with the NSF, I think, in giving you not 15 percent going in, but a bottom line figure of going in which you very carefully and properly have expanded on the basis of a proven record.

Would it make sense from your vantage point to apply that technique elsewhere with other agencies and have the major funding responsibilities under the present system?

Dr. SANDERSON. You really would have to decide on an agency-by-agency basis. I can certainly think of cases—I will not cite them here—where an agency does have the potential for a major involvement in small business. In many cases they are responding. In some cases a little more incentive might help.

There are some cases where it probably would not be useful. For example, in agencies which are primarily procuring very large systems, there may be an incompatibility between the small business' ability to respond to that type of procurement and any mandatory set-aside that the Congress might put on the agency.

Representative BRECKINRIDGE. I think the same argument was met with the percentage of procurement requirements. I think perhaps what you are really saying is that it ends up on a case-by-case basis, not just within agencies, but within particular procurement programs. That is an invitation to experiment and try it rather than to say that we should not undertake it; right?

Dr. SANDERSON. There needs to be a lot more experimentation in this area. The many benefits which you cite, like the relatively low cost of scientists and the relatively greater payoff, is not indicative of the NSF program. That is indicative of the ability of small business to

We have an overriding criteria of scientific excellence in all of the projects which we support. As I have told my colleagues, I would turn the money back to the Treasury rather than lower our standards and quality.

We have found that there are a lot of good ideas, a lot of opportunities to find this quality in the small business community, and a substantial number of people in the small business community organizations who are interested in competing for funds and projects, not in preferential treatment, but in open competition with the existing research resources.

We have made substantial effort in recent years to reach the small business community through the small business conferences and other activities of the Foundation.

The National Science Foundation announced a few months ago a new thrust, involving both small and large business, for university-industry coupling in research programs where we can take advantage of the basic scientific capability developed in U.S. universities and the entrepreneurial innovative skills residing in U.S. industry. This has been the most recent initiative in this area.

As I stated in my testimony, we anticipate further initiatives in the small business area in the coming years, initiatives modeled on some of the things learned in the experiments to date.

Representative BRECKINRIDGE. The opening statement that you made indicates that your experience is to the effect that the cost of scientists in the small business sector is 50 percent lower when compared with large business. I can appreciate that, and this intends no criticism but merely a finding of fact.

You also add a new dimension and a new figure for my files when you say that the research productivity of each of these scientists or engineers is 2.6 times greater. So, you get into a geometric multiplication of return here.

I want to say something for the record and then I want to ask another question.

I am particularly impressed by the conservative approach that you have taken and the qualitative, as distinguished from quantitative approach. We are so used to throwing money up against the wall technique.

I am impressed with the level of return that has resulted from that process. I take it that you have established a sound, solid, growing, promising, and a challenging program. I am not suggesting in any way that you forsake any part of it.

My question is: Why do you not do more about it? Your answer is going to be: You are doing all you can with the limited assets made available to you. Then we will talk about what we can do about that.

Dr. SANDERSON. Since you have already written a scenario, I can give you another to go with it, Mr. Chairman.

If we had started off in the first year saying that we were going to put 15 percent of our resources into small business R. & D., then I am not at all sure we could have made it. We have learned a great deal in the past 4 or 5 years as we have moved along. We have learned things that will work for an agency like NSF for an applied research

We estimate that additional centers could be established over the next 5 years and distributed geographically in order to serve the entire Nation. In our optimistic moments we believe such a program conceivably could account for the development of 200 to 300 new technology-oriented businesses per year with a gross sale approaching $300 million and could provide technical assistance to several thousand existing businesses. The return to the Federal Treasury in taxes on corporate profits and employee payrolls on the four centers now in operation is already nearly 10 times as large as the average annual investment by NSF in the program.

NSF support of the three original centers is scheduled to end this year. One of these has demonstrated its ability to continue without further support. Renewed budget support and expansion of this program should match the goals of this committee.

The Foundation has been pleased to share what we have learned in running these innovation centers with a number of other Federal agencies, and we will continue to work with all organizations to assist in disseminating the results of this research.

A second similar type of activity is the university industry cooperative research centers which are designed to combine the research skills residing in the universities with the needs of specific industries or groups of industries.

In particular this program is designed to honor research efforts for businesses too small to do their own. In actual practice, the one center which has received the greatest support combines both large and small businesses as members of the same center. This is the Polymer Research Center at MIT.

The National Science Foundation, and its Director, Dr. Atkinson, recently received an award from MIT and the polymer industry for program excellence. At present, this program receives about a half million dollars in direct support from its industrial sponsors who range from General Motors to Rogers Corp., relatively speaking, a very small business. All NSF support for the center at MIT ceased in July 1978 and the industry is currently supporting the full cost of the center operation.

A second university industry center is the Furniture Research Center established at North Carolina State University. There, Government and industry have shared the costs of R. & D. on a continuing basis to provide technical assistance to a relatively small fragmented industry of furniture manufacturers.

In our applied research directorate we have a regulation program which is studying a number of the problems related to the regulatory impact of compliance on both small and large businesses. What is at stake, many feel, is the ability of small business to absorb the cost of compliance with public regulation. There is, it is argued, a relative disadvantage to small business in this area. This is so because it is felt there are economies of scale in complying with diverse Government regulation. If this turns out to be the case, and some of the research we currently support examines this issue, regulations may place small business in various industries at a comparative disadvantage with the larger, more established firms.

For the immediate future of the ASRA program, we are planning to have at least one small business solicitation and two small business

project. We provide additional merit or credit to those proposals which are accompanied by a commitment or identification of the following venture capital.

This requirement that the venture capital be obtained in advance of the principal Federal research support forces the proposer to think in advance about the potential commercial of the research and, as was pointed out earlier, possibly to modify his approach in order to achieve, at the same time, both the Federal objective and a future commercial objective. The requirement also forces consideration of the technology transfer of the federally funded research to the civilian sector in the early proposal planning stages. It is a much stronger statement of the utilization of the research than statements which are not encouraged to obtain such financial commitments.

This approach provides small firms with something specific that will help them to attract the follow-on venture capital. The firm first can show that it had the technical competence to receive the NSF award and that Government funding can minimize the higher front-end research risk. The company also can show that it competed and was successful in winning a phase II award and achieving certain mutually agreed objectives before the venture capital commitment is required for the development phase.

The lowering of this front-end risk has proved a substantial incentive for venture capital firms or for large manufacturers who have been approached, or who have approached small businesses with expressions of interest.

From this program, results to date show that 329 proposals were received the first year under the phase I competition and 42 awards were made, totaling $1,028,000. Thirty-six of those 42 recipients had submitted phase II proposals which are currently in the process of review.

Not all of the research topics selected were relevant to venture capital, but 14 of these firms have now provided commitments or specific letters of interest by third party funds for the follow-on funding.

We anticipate that we will be making the phase II awards in September and October, totaling between $2 million and $3 million.

We believe that this program not only encourages the small science and technology firms, technological innovation, and venture capital, but can increase the benefits to the private sector and the payoff from federally funded research.

Last fall, as Mr. Breckinridge mentioned, the small business program received the first annual award for Federal Small Business Program Excellence from CASIBA, the Council of Small and Independent Business Associations. Small business innovation programs and solicitation have also won endorsement from many other sources. I have included a small sample of some of the other statements made about the programs as an attachment to my testimony.

While this program has attracted a great deal of favorable support, the majority of the small busniess awards in ASRA have not come from the special type of solicitation. Approximately 300 awards, totaling over $20 million, have resulted from unsolicited proposals from small business. We match their interest to the program elements of ASRA, such as earthquake technology, research and problems of chemical threats in the environment, technology for the handicapped, or production technology.

Dr. SANDERSON. The witnesses for the hearing yesterday, as your opening statement pointed out, emphasized the importance of small business and small business R. & D. to our national economy and overall well-being.

I will not go further into that. My testimony does have a couple of brief references to it, but I think we all agree that there is an important function that can be played only by U.S. small business in the free enterprise system through its ability to carry out the R. & D. technical innovations and bring products to the markets. It is a unique role in our society.

I would like now to describe briefly the Applied Science Research Applications Directorate; to say something about the achievements of our small business programs and how the programs have been received by the small business community; and finally, to outline briefly some of our future plans in this area.

The Nation has made a major investment in R. & D.—basic research and applied. The Foundation occupies a preeminent role in the basic research end of the spectrum. The goal of the Applied Science Research Applications Directorate is to increase the contribution of the scientific discovery and the wealth of scientific knowledge we are developing by identifying and supporting research and other activities that have the highest potential for transferring scientific knowledge into technological innovation and into use.

To do this we are organized in a variety of activities, some of which—integrated basic research, for example—is designed to emphasize fundamental research in areas where it is clear there is still a knowledge gap in our basic scientific understanding of phenomenona important in dealing with national problems or other major problems of society.

One of two programs closest to the interest of this group is the applied research activity, designed to provide a scientist-engineer from a university, from a small business, from any type of operation the opportunity to define longer time applied research problems and a scientific method of trying to solve those problems and to compete for Federal support in a very tough and very rigorous examination not only of the scientific quality of the ideas but of the importance and utility of discoveries if the idea works out.

Second, the Problem Analysis Office is designed to identify and analyze major national problems which have significant scientific and technological content and to attempt to find an assessment of the appropriate role of science and technology.

A third activity, problem focused research application, is at the end of the spectrum it is designed to concentrate a portion of the Nation's resources on dealing with selected problems which have been identified.

I emphasize the Division of Applied Research and the problem focused area because that is where a substantial involvement of the small research business community occurs.

The locus of the small business involvement is in the intergovernmental science and public technology program. It has the specific responsibility for encouraging the integration of science and technology into program and policy planning at the State and local levels and to

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:CHNOLOGICAL DEVELOPMENT OF THE SCIENCE BASE OF THE NATION. WE
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HE COMMON GOOD OF ALL CITIZENS. I THANK YOU FOR THIS OPPORTUNITY
O APPEAR BEFORE YOUR COMMITTEES. I WOULD BE PLEASED TO ANSWER
UESTIONS ABOUT ANY OF OUR PROGRAMS.

UNIVERSITY-INDUSTRY COOPERATIVE RESEARCH CENTERS

THE UNIVERSITY/INDUSTRY RESEARCH CENTER PROGRAM IS DESIGNED TO COMBINE THE RESEARCH CAPABILITY OF THE UNIVERSITIES OF THE U.S. WITH THE NEEDS OF SPECIFIC INDUSTRIES OR GROUPS OF INDUSTRIES. IN PARTICULAR, THIS PROGRAM IS DESIGNED FOR BUSINESS TOO SMALL TO MOUNT A MAJOR RESEARCH EFFORT ON THEIR OWN. IN ACTUAL PRACTICE, THE ONE CENTER WHICH HAS THE LARGEST AMOUNT OF FINANCIAL SUPPORT INCLUDES BOTH LARGE AND SMALL BUSINESSES AS MEMBERS OF THE SAME CENTER. THIS IS THE POLYMER RESEARCH CENTER AT MIT. THE NATIONAL SCIENCE FOUNDATION AND ITS DIRECTOR, DR. RICHARD ATKINSON, RECENTLY RECEIVED AN AWARD FROM MIT AND THE POLYMER INDUSTRY FOR PROGRAM EXCELLENCE. THIS PROGRAM CURRENTLY RECEIVES ABOUT HALF A MILLION DOLLARS OF SUPPORT ANNUALLY FROM ITS INDUSTRIAL SPONSORS, RANGING FROM GENERAL MOTORS TO ROGERS CORPORATION - RELATIVELY SPEAKING A SMALL BUSINESS. ALL NSF SUPPORT CEASED IN JULY 1978, AND THE CENTER IS CURRENTLY SELF-SUSTAINING.

A SECOND UNIVERSITY/INDUSTRY CENTER IS THE FURNITURE RESEARCH CENTER AT NORTH CAROLINA STATE UNIVERSITY THAT HAS DEMONSTRATED HOW GOVERNMENT AND INDUSTRY CAN COST SHARE R & D ON A CONTINUING BASIS.

THE REGULATION RESEARCH PROGRAM STUDIES A NUMBER OF PROBLEMS THAT RELATE TO THE IMPACT OF REGULATORY COMPLIANCE ON BOTH SMALL AND LARGE BUSINESSES, TAKEN TOGETHER. WHAT IS AT STAKE, MANY FEEL, IS THE ABILITY OF SMALL BUSINESS TO ABSORB THE COST OF COMPLIANCE WITH PUBLIC REGULATIONS. THERE IS, IT IS ARGUED, BOTH AN ABSOLUTE AND RELATIVE DISADVANTAGE TO SMALL BUSINESS VERSUS LARGE BUSINESS. THIS IS SO BECAUSE IT IS FELT THAT THERE ARE ECONOMIES OF SCALE IN COMPLYING WITH DIVERSE GOVERNMENT REGULATIONS.

THESE CONFERENCES HAVE PROVEN TO BE EFFECTIVE INSTRUMENTS FOR PROVIDING AN OPPORTUNITY FOR SMALL BUSINESS PARTICIPATION IN FEDERAL PROGRAMS.

A NEW PROGRAM AT ASRA THAT WILL AFFECT THE LEVEL OF SMALL BUSINESS AWAROS IS THE APPROPRIATE TECHNOLOGY PROGRAM. OESIGN OF THIS PROGRAM IS BEING LAUNCHED THIS SUMMER ANO EARLY FALL WITH SEVEN REGIONAL FORUMS. A FULL REPORT FROM THESE FORUMS IS SCHEDULED FOR RELEASE IN OECEMBER 1978. BY THE VERY NATURE OF THE INTEREST IN THE FIELD OF APPROPRIATE TECHNOLOGY, WE EXPECT SMALL BUSINESS TO PLAY A STRATEGIC ROLE IN THIS RESEARCH.

INNOVATION CENTERS

NSF RESEARCH INTEREST IN THE INNOVATION CENTER EXPERIMENT IS TO STUDY ALTERNATE WAYS TO MOBILIZE UNIVERSITY STAFFS AND FACILITIES AS A RESOURCE TO NEWLY CREATED FIRMS. THERE ARE FOUR ACTIVE CENTERS IN THIS PROJECT: AT CARNEGIE-MELLON, MIT, UNIVERSITY OF OREGON AND UNIVERSITY OF UTAH. OVER THE PERIOD OF THIS EXPERIMENT THERE HAS BEEN WIDESPREAD INTEREST IN THIS PROGRAM, BOTH WITHIN THE U.S. AND ABROAD. DURING THE PERIOO OF THE EXPERIMENT SOME TWO DOZEN NEW BUSINESSES HAVE BEEN STARTED FROM THESE CENTERS. SALES ARE IN EXCESS OF $15,000,000 A YEAR AND GROWING AT A 50% PER YEAR RATE.

THE IMPORTANCE OF THIS PROGRAM IS THE OEMONSTRATION THAT NEW BUSINESSES AND NEW JO8S CAN BE CREATED THROUGH UNIVERSITY TRAINING AND ENTREPRENEURIAL DEVELOPMENT. MORE THAN A THOUSAND NEW JOBS HAVE BEEN CREATED BY THESE CENTERS. ACCORDING TO A CURRENT STUDY AT THE BROOKINGS INSTITUTE, THE COST IN FEDERAL FUNDS TO CREATE A SINGLE ADDITIONAL JOB AVERAGES $25,000. THIS FIGURE IS OVER EIGHT TIMES THE $3,000 COST FOR JOBS CREATED THROUGH

RESULTS TO DATE SHOW THAT 329 PROPOSALS WERE RECEIVED UNDER PHASE I AND 42 AWARDS WERE MADE, TOTALING $1,028,000. THIRTY-SIX OF THE PHASE I AWARDEES SUBMITTED PHASE II PROPOSALS WHICH ARE NOW BEING REVIEWED. NOT ALL OF THE RESEARCH TOPICS WERE RELEVANT TO VENTURE CAPITAL, BUT 14 HAVE PROVIDED COMMITMENTS OR SPECIFIC LETTERS OF INTEREST BY THIRD PARTIES FOR FOLLOW-ON FUNDING. WE ANTICIPATE PHASE II AWARDS IN SEPTEMBER AND OCTOBER TOTALING BETWEEN $2 AND $3 MILLION. WE BELIEVE THE PROGRAM NOT ONLY ENCOURAGES SMALL SCIENCE AND TECHNOLOGY FIRMS, TECHNOLOGICAL INNOVATION, AND VENTURE CAPITAL BUT CAN INCREASE THE BENEFITS TO THE PRIVATE SECTOR AND THE PAY-OFF FROM FEDERAL RESEARCH.

LAST FALL THIS SMALL BUSINESS PROGRAM RECEIVED THE FIRST ANNUAL AWARD FOR FEDERAL SMALL BUSINESS PROGRAM EXCELLENCE OF COSIBA, THE COUNCIL OF SMALL AND INDEPENDENT BUSINESS ASSOCIATIONS, WITH WHICH YOU ARE ACQUAINTED.

THE SMALL BUSINESS INNOVATION PROGRAM SOLICITATION HAS RESULTED IN ENDORSEMENT FROM MANY SOURCES IN ADDITION TO THE COSIBA AWARD.

LAST YEAR THE NSF INITIATED A NEW PROGRAM ENTITLED SMALL BUSINES INNOVATION APPLIED TO NATIONAL NEEDS. THE PROGRAM HAS BEEN PARTICULARLY WELL RECEIVED BY THE SMALL BUSINESS AND VENTURE CAPITAL COMMUNITIES. ALTHOUGH ITS PRIMARY OBJECTIVE IS TO FUND QUALITY RESEARCH PROPOSALS ON ASRA PROGRAM OBJECTIVES, IT HAS TWO OTHER PRINCIPAL GOALS. ONE IS TO STIMULATE TECHNOLOGICAL INNOVATION IN THE PRIVATE SECTOR AND THE SECOND IS TO DESIGN A PROGRAM TO MEET THE NEEDS OF SMALL SCIENCE- AND TECHNOLOGY-BASED FIRMS, AS WELL AS THOSE OF THE FEDERAL GOVERNMENT.

THE PROGRAM WAS STRUCTURED IN TWO PHASES: PHASE I WAS TO PROVIDE RESEARCH AWARDS OF APPROXIMATELY $25,000 TO DETERMINE THE FEASIBILITY OF INNOVATION IDEAS PRIOR TO A LARGER INVESTMENT; PHASE II WAS TO PROVIDE A HIGHER LEVEL OF FUNDING TO THOSE PROJECTS SHOWING THE MOST PROMISE AFTER COMPLETION OF THE FEASIBILITY STUDIES. THIS SMALL BUSINESS INNOVATION PROGRAM IS UNIQUE IN A NUMBER OF WAYS. FIRST OF ALL, IT EMPHASIZES RESEARCH ON ASRA PROGRAM OBJECTIVES THAT ALSO HAVE THE POTENTIAL FOR TECHNOLOGICAL INNOVATION BY THE SMALL FIRM USING FEOERAL RESEARCH AS A BASE. SECONOLY, IT ENCOURAGES THE SMALL FIRM TO OBTAIN A COMMITMENT FOR FOLLOW-ON PRIVATE VENTURE CAPITAL FROM A THIRD PARTY TO PURSUE POSSIBLE COMMERCIAL APPLICATIONS OF THE FEOERALLY FUNOED RESEARCH.

FOR SCIENTIFICALLY MERITORIOUS RESEARCH ON PROBLEMS DEFINED BY THE PROPOSAL AUTHOR THAT DO NOT FIT WITHIN ESTABLISHED NSF PROGRAMS, THE PROGRAMS OF OTHER AGENCIES, OR THE PRIVATE SECTOR, AND TO ACCELERATE GROWTH OF THE SCIENTIFIC BASE UNDERLYING NEW OR DEVELOPING TECHNOLOGIES. THE OBJECTIVE OF PROBLEM-FOCUSED RESEARCH APPLICATIONS (PFRA) IS TO FOCUS SCIENTIFIC AND TECHNOLOGICAL CAPABILITIES ON SELECTED PROBLEMS WHERE NSF CAN MAKE A UNIQUE CONTRIBUTION TO THE SCIENCE AND TECHNOLOGY BASE NEEDED FOR THEIR TIMELY, PRACTICAL SOLUTION.

THE OBJECTIVE OF INTERGOVERNMENTAL SCIENCE AND PUBLIC TECHNOLOGY (ISPT) IS TO ENCOURAGE THE INTEGRATION OF SCIENCE AND TECHNOLOGY INTO PROGRAM AND POLICY PLANNING AND EXECUTION BY STATE AND LOCAL GOVERNMENT, AND TO TEST AND EVALUATE SELECTED INCENTIVES WHICH THE FEDERAL GOVERNMENT MAY USE TO STIMULATE R & D INVESTMENT IN THE PRIVATE SECTOR WHERE NEW TECHNOLOGY IS NEEDED IN THE NATIONAL INTEREST.

THE MANAGEMENT OF THE SMALL BUSINESS PROGRAM IS CENTERED WITHIN THE INDUSTRIAL PROGRAM OF THE INTERGOVERNMENTAL SCIENCE AND PUBLIC TECHNOLOGY PROGRAM, AND MOST OF THE SPECIFIC ELEMENTS WHICH I WILL DISCUSS TODAY ARE MANAGED BY THE INDUSTRIAL PROGRAM. HOWEVER, ALL DIVISIONS OF ASRA, WITH THE EXCEPTION OF THE INTEGRATED BASIC RESEARCH DIVISION, REGULARLY MAKE AWARDS TO SMALL BUSINESS. IN THE APPLIED RESEARCH AREA NSF HAS BEEN MAKING AWARDS TO SMALL BUSINESS SINCE FY 1971. BY THE END OF THIS FISCAL YEAR 1978, THE APPLIED RESEARCH DIRECTORATE AT NSF WILL HAVE MADE 368 SUCH AWARDS TOTALING OVER $31 MILLION. THESE AWARDS HAVE BEEN IN ALL AREAS OF NATIONAL IMPORTANCE, ENERGY, ENVIRONMENT, PRODUCTIVITY, ETC.

STATEMENT OF
DR. JACK T. SANDERSON
ASSISTANT DIRECTOR FOR APPLIED SCIENCE AND RESEARCH
APPLICATIONS, NATIONAL SCIENCE FOUNDATION
BEFORE A JOINT HEARING OF THE
SENATE COMMITTEE ON SMALL BUSINESS, AND THE SUBCOMMITTEE ON
ANTITRUST, CONSUMERS AND EMPLOYMENT, HOUSE COMMITTEE ON
SMALL BUSINESS
AUGUST 10, 1978

I AM PLEASED TO APPEAR BEFORE YOUR COMMITTEES AND TO HAVE THE OPPORTUNITY TO DESCRIBE THE ROLE OF THE APPLIED SCIENCE AND RESEARCH APPLICATIONS DIRECTORATE (ASRA) IN BROADENING THE SCIENTIFIC AND TECHNOLOGICAL BASE OF SMALL BUSINESS ORGANIZATIONS IN THE UNITED STATES.

THE RECORD CLEARLY SHOWS THAT SMALL BUSINESSES ARE EFFICIENT RESEARCH AND DEVELOPMENT ORGANIZATIONS. DATA INDICATE THAT NOT ONLY THE COST OF SCIENTISTS IS 50% LOWER IN SMALL BUSINESSES WHEN COMPARED TO LARGE BUSINESSES, BUT ALSO THE RESEARCH PRODUCTIVITY OF EACH OF THESE SCIENTISTS OR ENGINEERS IS 2.6 TIMES GREATER. THESE FACTS HAVE BEEN ESTABLISHED NOT ONLY THROUGH A STUDY OF PATENT AWARDS, BUT BY CAREFUL ANALYSIS OF 310 MAJOR INNOVATIONS OVER THE PAST FEW DECADES. THIS PROVEN INNOVATIVE CAPACITY OF SMALL BUSINESS IS AN IMPORTANT NATIONAL ASSET IN THE CREATION OF NEW JOBS, THE MAINTENANCE OF INTERNATIONAL COMPETITIVENESS, THE STRENGTHENING OF OUR DEFENSE CAPABILITIES, AND IN THE GENERAL IMPROVEMENTS OF OUR QUALITY OF LIFE.

WITH THIS BRIEF BACKGROUND, I WOULD LIKE TO DESCRIBE TODAY: 1) THE ASRA ORGANIZATION, 2) THE NATURE OF OUR SMALL BUSINESS PROGRAMS, 3) THE

We will welcome that.

You have made an outstanding contribution today. We will look forward to following that up personally.

Mr. GELLMAN. Thank you.

Representative BRECKINRIDGE. Mr. Patten, do you have questions?

Representative PATTEN. I thought it would be nice for some of you fellows who struggle with these problems to know that I have two or three young men in the room who will go into their senior year. They leave me tomorrow. They have been around here for about 6 weeks. I thought you might like to see them.

I have faith in our future when I look at them. How about the fellows in the office stand up and let these people see you?

[Applause.]

Representative PATTEN. They are beautiful.

Representative BRECKINRIDGE. We are delighted to have you.

Representative PATTEN. They will go back thinking probably we are a great deliberative body representing the people. I think they will.

Representative BRECKINRIDGE. They look smarter than that, to me. [Laughter.]

Representative PATTEN. They are smarter than I am. They will all be running for Congress. [Laughter.]

Representative BRECKINRIDGE. Let me introduce Mr. Herb Spira, who is General Counsel of the Senate Small Business Committee. He sits on my right.

I did not mean to let the witness get away. If you had a question, I wanted you to have time. Perhaps you can submit it in writing later on.

Representative PATTEN. You know, for some of you Government witnesses, we would like to feel, in my area, in the Princeton, New Brunswick area with all the chemical plants and pharmaceutical plants where Dr. Waxman discovered streptomycin that we are in the picture when it comes to research.

Your companies, NASA, and the space program under the military, we feel it with our R. & D. people. I feel it very much. I can name the industries that would be familiar to you.

Princeton gets a mark of excellence on electronics. So, Mr. Chairman, in my area, according to statistics, we are in the picture when it comes to R. & D. My attitude, as a rule, is quite favorable and tolerant of that.

Representative BRECKINRIDGE. Excuse me, Mr. Patten. We have a live quorum so we are going to have to go.

We will take this rollcall and we will be right back.

[Recess taken.]

Representative BRECKINRIDGE. The committees will resume their sitting.

I want to welcome our next witnesses, Dr. Jack T. Sanderson, Assistant Director for Applied Science and Research Applications, National Science Foundation.

I would like to say, starting off, if I might, Dr. Sanderson, that we have had a lot of opportunity to visit with a lot of Government witnesses, but we have not had too many opportunities going in.

We have had some problems, I think, getting some attention in some

an R. & D. outcome—typically a Government agency—which may well be just as ignorant of technology delivery and innovation as is the R. & D. producing enterprise itself. This is a very serious problem in my judgment.

I admit that the implications of what I am saying are not entirely favorable in the short run for small enterprise, but I think that the implications are potentially very beneficial for enterprise, small and large, in the long run.

Representative BRECKINRIDGE. Let me ask you to extend your thoughts along these lines, if you will. in the record at a later date, giving us some illustrations of the type of Federal investment and the type of R. & D. that you think fits this pattern and which is counterproductive.

Mr. GELLMAN. Certainly.[1]

Representative BRECKINRIDGE. Without objection, so ordered.

Mr. GELLMAN. May I conclude with two points?

Representative BRECKINRIDGE. Certainly.

Mr. GELLMAN. I think it is high time that we learn through experimentation or otherwise just what the effects are of the usual Government practice of not allowing parties who have proceeded with R. & D. in whole or in part with Government funding, to retain the proprietary rights to their works product on an exclusive basis. That is, we must discover the extent to which this practice is causing us problems in getting beneficial technology generated and delivered to the marketplace. I frankly do not know to what extent the usual lack of ability on the part of Government to grant exclusivity to such firms or people is a hinderance if it is one at all. But I am absolutely certain that if it is not a reason for having innovation thwarted where Government R. & D. contractors are concerned, then it is an excuse that many entrepreneurs use when they say: "We cannot go forward with this because we cannot get the exclusivity back and we do not want to invest capital in going the next step if we do not have exclusivity."

Whether it is a reason or whether it is an excuse, we can only find out by granting these proprietary rights back and seeing what happens. I think it is appalling that there has not been more granting back, particularly to small enterprise, and maybe only to small enterprise. I understand some of the reasons why this is so; I have followed this for some while. Nevertheless, I think it is time to grab the bit in our teeth. I am aware that the Congress, in its great wisdom, granted DOE certain ability to grant back technology to people they fund. I think they have been very slow in going forward with that ability. I do not know why. I think it is high time we got on with it.

But make no mistake about it. In my view, at least, energy is not the only area where this ought to be done. For instance, I would personally be very interested in observing what would happen, if anything, were the FAA to be provided the same freedom to grant back proprietary rights to its E. & D. contractors that DOE now has—but does not yet use.

While we have studied many things relating to various aspects of the process of innovation for many years, I could not agree more that

[1] Material not available at time of going to press.

He indicated they were doing that, or that they were contemplating it and intended to do it. In those areas, where they had a concensus or an agreement, they would move forward on the basis of the OMB report and other data and reports that were before the committee.

My question is an enlargement of yours. Everybody is scared to death of new agencies, but everybody is demanding the recognition, identification, and discharge of new functions. What you are suggesting here is within the framework of the task force.

On the basis of your experience with the various Federal agencies, where do you think such a responsibility should logically be lodged? Under whose direction and whose responsibility in the chain of command at the White House should this lie to see that it becomes something other than a showpiece and a talkpiece and actually, in fact, does covert to a clearinghouse workpiece?

Mr. GELLMAN. I am afraid I have a very strong bias toward looking at the individuals among any cast of characters. In other words, I think that perhaps using the right person to sparkplug an effort is more important than where he sits. There are some constraints on that, of course. But in the present situation, from what I know, I would suggest that the convening party for the sort of undertaking we are both talking about might best be Jordan Baruch.

I think it is very important that people who occupy senior policy positions related to research and development, or E. & D., or whatever you want to call it, should, above all, be people who know the value of science and technology. The value of science and technology is exploited through the process of innovation when that science and technology are translated into viable products and services.

Representative BRECKINRIDGE. Let me interrupt for just a moment to say that we are honored and privileged to have with us Representative Edward Patten from New Jersey who wants to introduce a constituent who will be a member of our panel later.

I asked him if he wanted to do it now and he said he was so entranced with what you were saying that he thought he would stay here as long as he could.

Representative PATTEN. We are going to have some old friends here this morning, so good luck to you, Mr. Chairman.

I told my constituent this. I said:

The chairman is out of Kentucky. Let him know that you like to drink bourbon and you like horses and that you like tobacco. Come in and smoke a cigar with a bottle of bourbon and you'll make a big hit with the chairman.

That is the advice I gave him. [Laughter.]

Representative BRECKINRIDGE. I would like to say that this is the first time to my knowledge that the gentleman from New Jersey, Mr. Patten, has overlooked the most important product of the Commonwealth of Kentucky, and that is mainly its beautiful ladies.

Representative PATTEN. He sounds like "Happy" Chandler. [Laughter.]

Representative BRECKINRIDGE. We are happy to have you, sir.

Representative PATTEN. There is always a bone of contention. You are on first, Mr. Gellman. My man will be an outside witness. He wants to be last to be in a position of rebuttal. [Laughter.]

Representative BRECKINRIDGE. Thank you.

the cases where it does not. In this way we can distinguish those stages that are externalizable with little risk in the typical innovation process to see what the implications are for enterprise, particularly small enterprise. I suggest that this is something that ought to be analyzed further.

Representative BRECKINRIDGE. Let me get you to define that for me a little more closely.

Mr. GELLMAN. Certainly.

Representative BRECKINRIDGE. When I was a boy, my father gave me a large dictionary and said: "I want you to put three words a day on your mirror in the morning." You have given me two—ideation and externalization. I have one to go for the day. I have an idea you will give me that before we are through.

You have put your finger at a point for Government intervention. Is that the earliest point that you would suggest for that?

Mr. GELLMAN. No.

Representative BRECKINRIDGE. Not to interrupt your line of thought, but somewhere along the way let us see if we can pick out the point or points at which the Government has an affirmative contribution to make. You observed in your opening statement they are making negative contributions.

Mr. GELLMAN. I want to make it clear that certainly it is not in the technology delivery or post-R. & D. phases of innovation that the Government first has an interest in the process. It is arguable that in a large proportion of the innovation processes we need to carry out, Government should be interested much earlier than that. When I say "interested," I do not necessarily mean as a decisionmaker, but rather as a resource provider, particularly for small enterprise, and perhaps only for small enterprise. The Government's interest certainly appears earlier than "technology delivery," during which occur the prototyping and testing that I used only as examples.

To keep my remarks to a reasonable length, I would like to shift to asking explicitly what can Government do—and I have already suggested two things.

I think that Government as purchaser of goods and services, as purchaser also of R. & D. results, could be substantially more aware of the capabilities, the role, and the problems of small enterprise than is now the case. We have a very disparate range of understanding from Government department to department, agency to agency. There is a very disparate range of understanding of what small business contribution is and can be in the process of innovation. For example, I believe that there are people in the Department of Commerce—and I am sure elsewhere—that understand what small business is about and what its contribution can be in the context of R. & D. and innovation. They can understand it very well, both in terms of the Department of Commerce's procurement programs and in terms of formulating and executing policy. I think there are other agencies where this is absolutely not the case. Those agencies where the latter is the situation are often a particular problem because they may be both judge and jury on a quantum of technology, determining themselves what and when it will or will not get into the market.

Let me give you specific examples.

Of course, there is the antitrust enforcement which would go with that sort of thing.

Mr. GELLMAN. I would be prepared to address that in a subsequent submission. I would prefer not to answer that, frankly, without any data, and off the top of my head.

I will say this much. In carrying out a number of studies of the process of innovation, these remarks that I have just made about the difference between the role of patents in small versus large enterprise—these perceptions are based on literally hundreds of studies of the innovation process and of specific innovation processes.

I will be glad to supplement my comments to the best of my ability.

Representative BRECKINRIDGE. Thank you. That would be most useful.

Without objection, so ordered.[1]

If, in supplementing them illustratively, you might also append any conclusions, recommendations, or suggestions for remedial action that might address itself to the Congress' attention, that would be useful.

Mr. GELLMAN. Fine.

Representative BRECKINRIDGE. I am talking about in every respect.

Mr. GELLMAN. Thank you. I will take advantage of that. I have colleagues who are more expert in some areas than I, by far, and I will ask particularly one in the patent field to assist me in replying to that suggestion.

Continuing now, I think that all is not good with the way that so-called "R. & D. enterprises" operate—that is, small businesses operating in the context only of R. & D. in the process of innovation. Let me give you an example of what I mean. I think we have a significant longrun problem in this country, associated with the extent to which certain large buyers of R. & D. results—principally the Government—purchase such R. & D. results from enterprises—usually small—which have absolutely no interest and no intention of carrying the R. & D. results forward into the marketplace. I am not sure that this entirely serves the best interest of the small enterprise segment of our society in the longrun. Nor am I sure, by any means, that it serves the longrun best interests of the country.

I think such R. & D. firms, that is, the small enterprises, which do the most good, as it were, for both the owners, the entrepreneurs, and the country are those which are dedicated not only to generating technological possibilities through the R. & D. process. but which are also committed to exploiting those technological possibilities themselves by engaging in the technology delivery elements of the process that lead to market introduction.

Representative BRECKINRIDGE. That is the culminating point of your opening statement, if I understand you correctly. Absent that, it is like the tree that falls in the forest and there is no one to hear it. What difference does it make whether or not you have R. & D. and technological development if it is not developed.

Could you again, at your convenience, for the record give us some documentation and illustrations of that?

[1] Material not available at time of going to press.

or less employees. In 1964, out of 24, 13 emanated from enterprises that had 1,000 or less employees. And so the numbers go. In 1968, it was 10 of 19. In 1972—and that is the last year that I wil cite—it was 11 of 29.

These are significant numbers. I would not hold that 1,000 or less employees should be the measure of smallness, but that cut-off point was selected because of the way the basic data are organized.

What underscores the significance of the numbers I just quoted even more dramatically is that the number of employees was calculated as of the time of market introduction of the innovation. It is very clear that at the time of market introduction the firms were not as small as they were when the idea that led to the innovation was first conceived.

I think perhaps I ought to take a minute to explain some of the terminology that I am using and will continue to use. It should be clear that there is a continuing process that we call "innovation" which begins with an idea, concept, or invention, and which is complete only when something new and different is introduced in the marketplace—either a product or a service. Furthermore, that market introduction must take place through an arm's length transaction. That is the process of innovation, as we see it.

There are myriad elements in the process, extending from induction, idention, conception or creation, to the stage of introduction in the marketplace. Ultimately, however, success is measured only at the last stage, by results obtained in the marketplace.

If you will forgive a trite phrase, research and development standing alone are essentially the sound of one hand clapping. Unless R. & D. and the technological possibilities that flow from successful research and development activities are ultimately exploited through what we call the process of technology delivery, and unless there is market introduction, we do not get, from an economic perspective, the growth in the economy, the redistribution of income and the other effects that we seek from research and development. We merely get an expenditure on research and development results with no multiplier of significance. The multiplier and the other important economic effects only come, the important things only occur, when the research and development result, the technological possibility, is translated into something that the market will accept and will take and diffuse.

Now, if you have no front end, that is, no investment in research and development, then you do not get innovation by definition. There has to be this continuum.

The relationships between front-end, research and development, investment and the overall process of innovation are very little understood, either on a genetic basis, or, I am afraid, on an industry-by-industry basis. But one of the things I said at the outset that is clearly understood and recognized by most who labor in the intellectual vineyard over the innovation process is that small business, small enterprise, plays a critical role. We would be in much worse shape—nationally and in every other dimension—were it not for the small enterprise's contribution to the process of innovation. Yet it is the small enterprise that has the most substantial problems in going from