SMALL BUSINESS AND INNOVATION

JOINT HEARINGS

BEFORE THE

SELECT COMMITTEE ON SMALL BUSINESS
UNITED STATES SENATE

AND THE

SUBCOMMITTEE ON ANTITRUST, CONSUMERS AND EMPLOYMENT

AND THE

SUBCOMMITTEE ON ENERGY, ENVIRONMENT, SAFETY AND RESEARCH

OF THE

COMMITTEE ON SMALL BUSINESS
HOUSE OF REPRESENTATIVES

NINETY-FIFTH CONGRESS

SECOND SESSION

ON

UNDERUTILIZATION OF SMALL BUSINESS IN THE NATION'S EFFORTS TO ENCOURAGE INDUSTRIAL INNOVATION

AUGUST 9 AND 10, 1978

Printed for the use of the Select Committee on Small Business and the Committee on Small Business

U.S. GOVERNMENT PRINTING OFFICE

34-270 O WASHINGTON : 1978

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HEARING DATES

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WEDNESDAY, AUGUST 9, 1978

SELECT COMMITTEE ON SMALL BUSINESS, U.S. SENATE, AND THE SUBCOMMITTEE ON ANTITRUST, CONSUMERS AND EMPLOYMENT AND ON ENERGY, ENVIRONMENT, SAFETY AND RESEARCH, COMMITTEE ON SMALL BUSINESS, U.S. HOUSE OF REPRESENTATIVES,

Washington, D.C.

The committees met jointly, pursuant to notice, at 9:30 a.m., in room 424, Russell Senate Office Building, Hon. Thomas J. McIntyre, acting chairman, presiding.

Present: Senator McIntyre and Representatives Breckinridge and Bedell.

Also present: Herbert L. Spira, chief counsel, Senate Small Business Committee; Jere W. Glover, counsel, Antitrust, Consumer and Employment Subcommittee; and T. J. Oden, professional staff member to Senator McIntyre.

STATEMENT OF HON. THOMAS J. McINTYRE, A U.S. SENATOR FROM THE STATE OF NEW HAMPSHIRE

Senator MCINTYRE. The committees will please come to order.

This morning, the Senate and House Small Business Committees begin an investigation which can have a direct affect on the entire economy, and our military and disarmament positions.

Our national strength and confidence in these areas depends upon maintaining technical superiority.

However, the Department of Commerce stated in April 1977, that there were "disquieting trends" in U.S. productivity, the decline of applications for patents, the increasingly adverse balance of payments, and the sharp reduction in the number of technical companies being created.

Our Senate committee has since underlined the lack of risk capital available, which has restricted the number of small companies (net worth of under $5 million) able to register and sell stock to only 52 in the past 4 years (1974–77).

We have also shown that many of the most advanced of these new companies are being acquired by foreign corporations; and that many of the survivors are short of capital and therefore vulnerable to an economic downturn.

This has brought home to us the necessity of a broad, coordinated approach to improving innovation.

We know that small enterprises can have a tremendous payoff for the Nation. A classical example has been in miniature electronics where

The hearings will take place on August 9 and 10, beginning at 9:30 a.m., on each day. The first morning will be conducted in the Senate Small Business Committee hearing room, 424 Russell Senate Office Building; and the second morning in the House Small Business Committee hearing room, 2359 Rayburn House Office Building.

Innovation is a matter of national importance, as indicated by the recent Presidential review memorandum requesting 28 Federal departments to encourage this activity. Small business in the past has made a striking record in this field. According to many studies, small enterprises and individual investors have accounted for between one-half and two-thirds of all U.S. inventions and innovations.

Those wishing to participate in the hearings may contact the Senate Small Business Committee (202/224–5175) or the House Small Business Committee (202/225–5821).

[The prepared statement of Representative Breckinridge follows:]

It is an unusual event when two Subcommittees of the House Small Business Committee get together with the Senate Small Business Committee itself to hold a joint hearing on any subject. The subject before us today--the role of small business in the scientific and technological innovative process--is a matter of great and mutual concern to my Subcommittee on Antitrust, Consumers and Employment, to Congressman Baldus's Subcommittee on Energy, Environment, Safety and Research and to Senator Nelson's Senate Small Business Committee. And so it is that the commonality of our interests brings us together here today: we are alarmed by certain forces at work in our economy, in our society at large, and even in our government, which have in the course of time weakened the role of small business in our life. Today, we will investigate this problem from a particular angle, focusing our attention on small business's role in innovation and on the share of federal research and development funds it receives to support it in this role.

I am most happy to co-chair these hearings with the distinguished Senator from New Hampshire. Senator McIntyre is well known for his long-standing dedication to small business and I would like, at this time, to commend him along with Congressman Bedell and Congressman Baldus on the enactment into law of their bill providing $75 million in direct and guaranteed loans for small solar energy technology businesses.

A review of a number of government studies and recommendations indicates that with regard to today's subject, we know what the problem is, that is, small business does not receive an amount of federal research and development funds that is

In his study entitled "Federal Support of Research and Development Activities in the Private Sector," Edwin Mansfield stated that "small firms play a large, perhaps disproportionately large, role in conceiving major new ideas and important inventions." The National Science Foundation's study, "Industrial Research and Development and Innovation," quantifies Mr. Mansfield's statement. I quote:

> On the basis of a sample of major innovations introduced to the market between 1953 and 1973, small firms (up to 1,000 employees) were found to produce about four (4) times as many innovations per research and development dollar as medium-sized firms (1,000 to 10,000 employees) and about twenty-four (24) times as many as large firms (over 10,000 employees). The total number of innovations produced by small firms was greater than for large firms, and both produced more than medium-sized firms.

Another very important angle on the relationship between small business and technological innovation is this: high technology firms, that is, small business firms, create far more jobs than low technology firms. According to a study performed by the Massachusetts Institute of Technology these high technology firms increased employment at a rate of forty (40) percent between 1969 and 1974; that is forty times the national population growth and translates into a figure of 25,558 new jobs, new employment opportunities opened up by small business.

Another study, conducted by Data Resources, Inc., supports this conclusion and includes some other interesting economic data. I quote:

> . . . employment in U. S. high technology industries grew almost nine times as fast as that in low technology ventures during the period between 1950

all of the other facts I have cited from these various studies--facts that prove that small business is the primary impetus behind innovations in science and technology. It makes no sense that small business receives such a paltry amount of the funds earmarked for a function that it performs best.

The purpose of these hearings is to explore this apparent paradox and its underlying reasons. We want to ask: If small business creates more than 1/2 the innovations and does it for 1/2 the cost, why doesn't small business receive more than 1/2 the federal research and development funds? If we can find the answer to that question, perhaps we can initiate a reversal in the trend. Perhaps, we can begin to insure that small business receives the share of research and development funds to which it is entitled.

The prices of high-technology products rose at only one-sixth of the rate of those of low technology industries;

The high technology companies expanded employment nearly nine times as fast as low technology companies; and

High technology products provided a growing balance-of-trade surplus whereas low-technology products suffered deficits.

Innovation must also play an important role in the solution of many of our other national and global problems. Meeting the needs of our growing world population, and assuring the stability of our global social systems, will depend in part on advances in science and technology and on their innovative application. As resources become more limited, the more efficient use of materials or the development of novel materials is essential if living standards are to be maintained or improved. Indeed, as our traditional energy sources are depleted, we must rely on the innovative application of science and technology to help us find new sources of supply or new ways to reduce our energy needs. Innovation can be expected to play a similar role in helping solve our pressing health and environmental problems. It is in part through technological innovation that we must find our path to a desirable future.

As you are aware, small enterprises play a particularly important role in the innovation process. Although there are dangers in generalization, it is clear that innovation is often the product of the dedication and perseverance of a small businessman with a novel idea. One need only examine the history of the firms along Route 128 near Boston and in the areas surrounding Stanford University to observe the remarkable record of such entrepreneurs. The most recent Science Indicators 1976, published by the National Science Board, shows that small firms—defined as 1,000 employees or less—produced more major innovations than large firms in the 1953–73 period. Moreover, the research activities of small firms are remarkably efficient. Science Indicators 1976 again shows that small firms produced nearly four times as many innovations per R. & D. dollar as medium size firms and about 24 times as many as large firms.

Although the United States has been blessed with more than its share of entrepreneurs who have developed whole new industries by the force of their innovative genius, we should not rest secure in the belief that this will always be the case. We should remember that in the 19th century the British were perhaps the world's leaders in technological development, but for a wide variety of reasons, that leadership has largely eroded. Several recent observations cause me some concern about the U.S. position:

(1) There is evidence of decreasing private investment in the research that could lead to entirely new products and processes. Industry leaders tell us it is "safer" to market incremental improvements in tried products and processes than to undertake bold innovation. Support for longer term research has waned.

(2) Industrial research managers tell us that they are having to put a larger share of their income into the so-called defensive measures to meet new environmental and consumer safety standards. As desirable as these standards may be (and I think most of them are), we must recognize that they require resources that might otherwise be used for

Senator McIntyre. Who will we hold responsible for the moving of the study, and the results of it; who will be responsible, Secretary Kreps or you?

Dr. Press. Secretary Kreps is the Chairperson of the study.

Senator McIntyre. The responsibility will rest on her shoulders?

Dr. Press. Yes. The steering committee will depend on her—the Secretary of the Treasury, the Secretary of Defense, myself, Charles Schultze, Stuart Eizenstat, and James McIntyre.

Senator McIntyre. Doctor, you are aware of the basic studies this committee has cited as background.

What circulation have they received, to your knowledge?

Dr. Press. I think the studies that you cited in your statement are known in the industrial community, in business schools, in the university departments, and, of course, they are known by those of us in Government who are very concerned with this issue. But I am not sure that they are known to the public at large.

There have been some recent articles in Business Week, in the New York Times, and in the Washington Post, as a result of the studies you referred to, and as a result of the President's initiative. I suspect that much more attention will be given to this in the public press, and, therefore, that the public will be more sensitive to the support of the issue.

Senator McIntyre. Doctor, are these studies part of the orientation package of participants in the review?

Dr. Press. Yes. These studies have guided our efforts in launching the domestic policy review and have played a role in helping define the tasks we should address.

Senator McIntyre. How is small business represented in the Presidential review?

Dr. Press. They are one of the agencies that serve on the Policy Coordinating Committee for the study. There also are a number of task forces, and they are certainly represented on the task forces.

Senator McIntyre. I would just comment, they ought to be very sizably represented.

They are accountable for 50 percent of the inventions that we have in this country.

Dr. Press. Senator, they are on every task force they want to be on.

We have asked them which of the task forces——

Senator McIntyre. Who did you ask, SBA?

Dr. Press. Yes.

Senator McIntyre. You have not yet considered any members of this task force that would be outside of a governmental agency?

Dr. Press. I am sorry.

Are you talking about the Small Business Administration, or representatives of small business?

Senator McIntyre. My last question, are these ladies and gentlemen just from the Small Business Administration, and I understood you to say yes.

Dr. Press. Let me go back.

The Small Business Administration is of course represented on this. Now, as Secretary Baruch will tell you when he describes the process in more detail later this morning, there will be a large number of

finance, availability of capital, equity, loans, things of that sort, and the contribution that can be made by small business.

Who is the person on your staff responsible to you, and with whom we can communicate with respect to assuring the adequate participation of the small business community, not just the SBA, for this research and various elements in this study?

Dr. PRESS. I can assure you that representatives of small business—working businessmen—will be on the outside task forces that we will set up to advise us as we go forward with the study.

The person with primary responsibility for directing the operation of the study is Assistant Secretary Jordan Baruch, who will be with you in a moment. He is in the Department of Commerce, and is one of the leading experts in the country in the innovation process. He also was a small businessman before coming to Government.

Representative BRECKINRIDGE. Will you tell me, for the record, who in your office on your staff is responsible to you for tracking small business participation?

Dr. PRESS. Let me say that the person on my staff who is tracking this whole issue is Richard Meserve.

Representative BRECKINRIDGE. Thank you.

I have just one question, and I want to phrase in a statement of fact, for your confirmation or agreement, and then ask the question; it is this: Based on the assumption, that small business creates more than half the innovations in America, and does it for half the cost, which is my understanding, why does not small business receive more than half the credible research and development funds, half the research and development funds, instead of 3.5 percent, which I understand now goes to small business, although it also receives between 23 and 25 percent of all Federal procurement funds, and what do you propose to do to see that that imbalance, if I am correct in my statement, is corrected?

Dr. PRESS. I think you are right. In fact in my testimony I highlighted the remarkable record of small business in the innovation process.

There is no question about it. In terms of innovations per dollar invested, of innovations per number of personnel, or just the total number of innovations, the record of small business stands out.

It is your perception that small business receive an inadequate portion of Federal research and development funds. Now, I am not sure why it is that in the overall R. & D. procurement process of $28 billion or so dollars, the small businesses receive the amount they do.

It is a very complicated question, and I will tell you what I will do.

If you address that question to me for the record, I will send it over to the Defense Department, and to the National Aeronautics and Space Administration, who are our major purchasers of R. & D. services. I would be interested in receiving their responses, and I will share them with you.

Representative BRECKINRIDGE. I would appreciate it, Doctor, but I do not think I would limit the question to those two agencies.

Dr. PRESS. Would you like to suggest other agencies?

Representative BRECKINRIDGE. No, sir. I would like to suggest the President determine what agencies he holds responsible for insuring that this is followed up.

because it appears very clear to me the Treasury is interested in doing what it can for big business, just as clear as anything.

Dr. Charles Schultze is very clear he is an economist, who is concerned about the economic policies, and he is concerned about what we are doing in our society.

Certainly Defense is very clear; it is interested in working with big business, because that is where they get more of their procurement.

I cannot believe for the life of me, if I were a small business person, that I would be jumping for joy over a study produced by a committee that is composed of those people that you mentioned; it may sound great, but if we really have a problem in our society, which I think we do, which is that we have Government policies directed toward helping big business, because of the power of big business, it appears to me this may sound great as far as technology is concerned, but if it is correct that small business generally has been the most productive in terms of dollars expended for the advancement of technology, then I would, if I were a small businessman, instead of jumping for joy, I would go into a period of mourning when I saw who was going to be in charge of this particular effort, and I do not think we ought to deceive anybody by trying to say how great this is, when we put those people in charge of something, that it will be a great bonanza for small business.

Dr. PRESS. Mr. Bedell, let me simply say that we all agree in this room about the tremendous contribution of small business to this country and to the innovation process.

I cited some of the statistics, and you did also. If you think that this study will overlook that contribution, or in any way demean it, by not paying proper attention to it, I think you are wrong. I assure you that we are sensitive to the issues that you have just raised, and we will pay proper attention to them.

Representative BEDELL. When Treasury does, I hope you will send me the information, because I have yet to see any policy from Treasury which was directed toward helping small business as compared to big business, and I think if you will look at the gentleman at the head of Treasury, it is constantly a parade from big business, and I have to voice their concerns that I think it sounds great, we can send out press releases how great it is, but I think we are really fooling the American public if we think just because the statistics show it should be helpful to small business.

I thank you.

Senator MCINTYRE. Thank you, Congressman Bedell and Congressman Breckinridge. Do you have other questions?

Representative BRECKINRIDGE. I would just like to extend Congressman Bedell's comments one step further.

I would be delighted to have you answer, but you can extend your remarks.

Again, foreign nations pay more attention to both in terms of scientific valuation and the appreciation of the problem, and in terms of national budgetary investment in research and development they devote more funds than does this Nation; and as you have pointed out, our investment in the small business sector is even smaller; it is something like 3.5 percent.

Do you agree with these facts? After your study is concluded, will it address this issue, and, lastly, should we engage in congressional

We are very interested in the Presidential review. We want to see it move ahead and do well.

Dr. PRESS. Thank you.

Senator MCINTYRE. Our next witness is Dr. Richard S. Morse, retired senior lecturer of the Sloan School of Management, Massachusetts Institute of Technology.

We are delighted to welcome you here, Dr. Morse.

Go ahead and testify in any way you wish.

STATEMENT OF DR. RICHARD S. MORSE, RETIRED SENIOR LECTURER OF THE SLOAN SCHOOL OF MANAGEMENT, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Dr. MORSE. If I may, I would like to read from my testimony.

I have been doing this same sort of thing now for over 15 years, so one develops a certain amount of frustration.

For many years, the Federal Government has sponsored study after study to examine the role of science and technology. There is also a growing interest of the academic community in such topics as science policy and technology transfer. In spite of these activities, the executive or legislative branches of Government and the public do not generally understand the manner in which the process of technological innovation operates, new business enterprises are created, and high technology based products and processes are brought to the marketplace.

There has never been a time when this country required a better understanding of technology and the role which it plays in our attempts to solve our many social problems, create jobs, and maintain a position of leadership in the competitive world markets. High technology products made a major contribution to our exports and are essential if we are to solve our current critical balance of payments problem and the declining value of the dollar.

There is certainly evidence to suggest that the continual creation of jobs in the industrial sector is very much dependent upon the creation of new companies particularly the more innovative organizations which can effectively utilize technology in the marketplace. It has also been pretty well established that really innovative ideas tend to come from "outside the industry." A study in 1976 [1] showed that during a 5-year period some six major mature corporations such as General Electric, Bethlehem Steel, and Du Pont with sales in 1974 of $36 billion created a net gain of only 25,000 jobs. During this same 5 year period, 5 new high technology companies had a net increase in employment of 35,000 jobs. Five innovative companies such as Polaroid, Xerox during this period with sales of $21 billion created 106,000 new jobs.

The total innovation process does not depend solely upon any one ingredient such as science, technology, capital or management. A wide variety of factors are responsible for the successful transition of an idea through to the development of a commercial product and acceptance by a customer. It is this total "process of technological innovation" with which Congress should be concerned and hopefully recog-

[1] "The Role of New Technical Enterprises in the U.S. Economy." A report of Commerce Technical Advisory Board to the Secretary of Commerce, January 1976.

car dictate the need for new ideas and management in this business. The Department of Energy recently issued a "request for proposal" essentially stimulated by the work of this small company. The company management was told that their chance of getting the R. & D. award would be low if they bid because they were not capable of undertaking commercial battery production. Cost sharing in the R. & D. program would also be necessary. Several of our largest industrial companies bid on the program and the winner was a battery manufacturer whose introduction to the new technology was dependent upon the ideas generated by the small company. The approval of the R. & D. proposals and management of the R. & D. contract are delegated to the Argonne National Laboratory where a battery development program is being performed "in-house" in direct competition with industry but no question has been raised about the commercial ability of Argonne.

Continuation of such a Government policy will deprive the Government of access to some of our more innovative technology which is found in new technical enterprises. This country has never had a real spokesman for small business, particularly the more innovative high technology companies, on the Washington scene. The National Science Foundation has appropriately been concerned primarily with the support of basic research and hopefully its role in this important area will be augmented. The Office of Science and Technology, within the White House, has historically tended to be more involved with studies dealing with major Federal projects, or fields of scientific endeavor from the viewpoint of OMB, budgeting and funding decisions. The economic impact of our deteriorating national environment for technology and innovation in the industrial sector has only recently been recognized. The Office of Technological Assessment, the appropriate arm of Congress to be concerned with the role of science, technology and the innovation process, has never addressed the influence of legislative action upon the business community and high technology companies.

In 1967, as members of the Panel on Innovation and Inventions, several of us were involved with the preparation of a study for the Secretary of Commerce under the direction of Dr. Robert A. Charpie. This report [2] was widely disseminated both here and abroad. I have personally briefed at least three Secretaries of Commerce, members of the White House staff, a President's science advisers, and two Assistant Secretaries of Treasury on its contents. Dr. Charpie and others have had similar activities and testified at innumerable congressional hearings.

The findings and recommendations of this report are as valid today as when they were enthusiastically received by the technically oriented managers in this country. It has already served to stimulate interest and action abroad among our competitive industrialized nations. No effective U.S. legislative or executive action has resulted from this study other than to initiate endless other studies which often plow ground which has already been investigated, are academic, or performed by institutions with little experience or knowledge of the innovation process and the management of technical enterprises.

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[2] Technological Innovation: Its Environment and Management, U.S. Dept. of Commerce, Washington, D.C., 1967; U.S. Govt. Printing Office.

a recent study [3] showed that some 32 executives of major corporations devoted 17.8 percent more of their time to Government regulations. Legal and accounting expenses of the same firms were up 260 percent in the same period.

A high technology innovative company [4] recently reported that 40 percent of its product development costs resulted from the impact of Government regulation and that they now deal with 74 different agencies. Perhaps more significantly the time to introduce a new product has now increased from 6 to 18 months.

The costs associated with reporting procedures required by the SEC are now very significant for a small company. The complexity of a registration statement now results in 300 percent greater cost than it did a relatively short time ago for example. Delays in granting approval for exports of high technology products also create problems for many small companies. Even our smallest companies are now concerned with antitrust questions.

(E) CAPITAL AVAILABILITY

Both large and small companies because of increased interest rates and cost of equipment replacement have serious problems in maintaining their cash flow to insure both return to investors and maintenance of a modern plant. Investment liquidity, the increased capital gains tax, and reduced incentives for management represent the three most important factors which now influence the financing of new enterprises.[3]

(F) IN-HOUSE LABORATORIES

There has been a growing tendency to employ our Government laboratories to manage commercially oriented programs and to conduct development activities, sometimes including the design and building of equipment, which should be undertaken within the private sector. Our Government "in-house" laboratories, and federally funded research institutions are often in direct competition with high technology companies but have a preferred position to receive Government funds.

Almost all federally sponsored studies as well as congressional hearings end with specific recommendations which involve new grandiose Federal programs. The last thing this country needs at the present time is another Federal program relating to science, technology, or the innovation process. We do urgently need a substantial reduction in the Federal bureaucracy including some of the federally funded R. & D. programs, studies, R. & D. management activities, and regulations. Most of the factors which militate against a more effective utilization of science and technology, the generation of new technical enterprises and the creation of a more favorable climate for small technical companies are well known. Actions can be undertaken now by appropriate departments and agencies by Executive order. Other actions will, of course, require legislation and the assumption of leadership responsibility by soneone in both Congress and the executive branch.

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[3] Richard S. Morse, The Changing National Environment for Innovation—Annual Meeting, National Academy of Engineering—Washington, D.C. February 1978.
[4] Millipore Corporation/Bedford Mass.—Personal Communication.

Zipper—Whitcomb Judson/Gideon Sundback.
Automatic transmissions—H. F. Hobbs.
Gyrocompass—A. Kaempfe/E. A. Sperry/S. G. Brown.
Jet engine—Frank Whittle/Hans Von Ohain.
Frequency modulation radio—Edwin Armstrong.
Self-wiuding wristwatch—John Harwood.
Continuous hot-strip rolling of steel—John B. Tytus.
Helicopter—Juan De La Cierva/Heinrich Focke/Igor Sikorsky.
Mercury dry cell—Samuel Ruben.
Power steering—Francis Davis.
Kodachrome—L. Mannes and L. Godowsky Jr.
Air conditioning—Willis Carrier.
Polaroid camera—Edwin Land.
Heterodyne radio—Reginald Fessenden.
Ball-point pen—Ladislao and Georg Biro.
Cellophane—Jacques Brandenberger.
Tungsten carbide—Karl Schroeter.
Bakelite—Leo Baekeland.
Oxygen steelmaking process—C. V. Schwarz/J. Miles/R. Durrer.

Senator McINTYRE. I see the jet engine on that list. United Technologies follows me around sometimes when they are trying to impress me with their need for selling the F–15. The list continues: The self-winding wristwatch, helicopter, well, I certainly think this should be part of the orientation package.

There are a lot of the regulations that prohibit small business from getting into the action, nothing has been done about that too.

Dr. MORSE. I would say that most actions since that report have made the situation worse.

I am now participating in one aspect of the current study under the Department of Commerce, and at the first meeting, this report was given as background reading so we could prepare our report—now over a decade old.

Senator McINTYRE. The committee and subcommittees here are concerned with the example that you have given of a small business being essentially precluded from getting funded for its own ideas in the battery field.

Can you give me an instance of another small company with a similar experience?

Dr. MORSE. I did not mean to say the small company was precluded from getting R. & D. support but it amounted to about that.

The impact of a cost sharing policy means that small companies cannot compete if they do not have the money. The cost of doing proposals is now prohibitive, it is impossible unless you are an aerospace company with knowhow to juggle the accounting, and carry the overhead from one account back to some other large contract.

Senator McINTYRE. Can you give another example, where a small company has had a similar experience in not being able to get into the action?

Dr. MORSE. I was familiar with a small company, which had a very substantial R. & D. contract for the development of the steam auto. This has now been canceled, as the emphasis now is on fuel economy as opposed to emissions in DOE programs.

As a result of this program, the small company developed a very small compact home heating unit, to produce both domestic hot water and heat for homes.

entrepreneurship within the firm, or investing in small companies with high technology.

Senator McIntyre. In your opinion is there adequate venture capital available? And, if not, what new sources might be developed?

Dr. Morse. Yes, sir, I think this country has still a spirit of entrepreneurship, both from the point of view of the investor and of others as well.

Interest in new technical enterprises and the availability of venture capital is scattered geographically. Such activities do not appear in certain parts of the country at all. Palo Alto and Boston, for example, have a large number of venture capital organizations.

I think we do need, however, to make new sources of capital available. For example, pension funds, which probably are the largest single source of untapped capital could be an interesting source.

If some changes in ERISA could be made to permit 3 or 4 percent of pension funds to engage in more speculative ventures, this could offer a tremendous potential amount of capital assuming the management ability were available to make the investment decisions.

We need some changes in regulatory areas to make it possible and more attractive for large companies to make venture capital available to small firms.

I think there are a number of SEC and antitrust rules which need review to permit a large company to invest its funds.

Some of these problems were outlined in the paper of the Commerce Technical Advisory Board of January 1976. I believe in there, for example, we suggested section 1244 should permit stock to be purchased by corporations as well as individuals.

A lot of money in this country would like to go to work, but a better climate needs to be created for a chance of return on new business enterprises.

Senator McIntyre. What role do you see for the academic community in our attempts to stimulate entrepreneurship and opportunity for new inventions?

Dr. Morse. I think we have a growing interest in this area among our universities and particularly our graduate schools of business.

I do not believe it is possible to create an entrepreneur, but I have a feeling that the latent characteristics of entrepreneurship can be developed in the classroom.

Americans historically have had a tendency toward being inventors. I think our academic community should recognize this, and assume a position of leadership in research on the innovation process and initiate courses on entrepreneurship.

For the last 15 years I have run a course at MIT for graduate students entitled "New Enterprises." This was a practical rather than a very academic course. My students got out of the classroom and examined typical high technology companies, analyzed criteria for success and failure, the venture capital business and the legal, financial and management problems of new enterprises.

"Route 128" was not created just because of MIT, nor was Palo Alto technical area because of Stanford alone. An area of new technical enterprises must have bankers, lawyers, universities, as venture capital sources and an attitude of entrepreneurship.

Dr. MORSE. Well, this is exactly why we have got to change the procurement policy.

The large corporation has R. & D. funds, but the small company has no independent funds for that purpose.

It cannot even afford the cost of a proposal. It cannot juggle its overhead back and forth between an Air Force contract and a NASA contract, for example.

It would be very simple, in my view, if we could only go back to the kind of contract procedure we had in the big war, it is hard to do with the sunshine laws and everything else, but that is the only kind of action which will permit the small innovative company to become involved with Government R. & D.

I think DOE has the authority to accept unsolicited proposals, they do not need to require cost sharing by a small innovative company.

Many problems can be solved by internal executive policy if our executive branch wanted to do so.

Such areas are examples that we could address right now. I do not see any chance of something happening in less than a year and a half based on the way we are now conducting more studies and hearings.

Senator MCINTYRE. Well, it will take tremendous effort to make breakthroughs because of the practicalities.

You remember the certificates of competency. It is addressed to the practical problem of: How can the Government deal with the XYZ company when they do not know who they are.

They may have the best man, a genius whom we have not discovered. But, the Government cannot deal with it. That is the practical situation, and over in Defense, and in many of these outfits, you can see the business there there is over there.

Well, we have to move on here. But, I would like to note here in response to your comment on ERISA as a source of funds, we have a bill (S. 1745), that we introduced last summer on that. The Department of Labor responded by publishing proposed regulations liberalizing their "prudent man" regulations, so we are trying to break through in some of these areas. We are trying to get some money loose instead of going around doing nothing to help this small entrepreneur.

I want to thank you very much for being with us this morning, and to thank you for your testimony today.

Dr. MORSE. Thank you.

Senator MCINTYRE. I call as our next witness Dr. Jordan J. Baruch, Assistant Secretary for Science and Technology, U.S. Department of Commerce. It is always good to see another New Hampshire man here contending with the difficulties we find ourselves facing today.

I welcome you here, Dr. Baruch.

Your statement in its entirety will appear in the record.

STATEMENT OF DR. JORDAN J. BARUCH, ASSISTANT SECRETARY FOR SCIENCE AND TECHNOLOGY, DEPARTMENT OF COMMERCE

Dr. BARUCH. The first thing I would like to do, Mr. Chairman, is to thank you for inviting me here.

I would like, before I do any testifying, to concentrate on what I mean when I use the term "technological innovation," so we all know what my use of the term implies.

of 13.2 percent while a similar series of mature firms grew 11.4 percent.

Despite the similarity in their sales growths, the employment in the mature firms grew only .6 percent while that in the innovative firms grew by 4.3 percent—over seven times as much.

Technological innovation in industry thus not only proivdes new products and services to advance our society's quality of life; it not only reduces the cost of existing products and services—often while improving their quality, it also serves as a major, non-inflationary source of new jobs.

While the record of large innovative firms is substantial, the record for small businesses based on technological innovation—especially those in high technology areas—is even more impressive.

In the same 5-year period, a series of such small businesses experienced sales growths of 42.5 percent—roughly three times as great as their larger counterparts.

Their employment in that period grew by 40.7 percent—almost 10 times the rate of the large innovative firms, and some 65 times as much as the large mature firms.

Clearly, the small firms have a special role in securing for society the benefits of technological innovation.

Some statisticians rightly may scoff at the use of percentages for comparsion, so let me quote some absolute numbers.

During those 5 years, six large mature firms having combined sales of $36 billion created 25,000 new jobs.

At the same time only five young high-technology firms with one-fortieth their sales—$875 million—created 35,000 new jobs.

Five large innovative firms with sales of $21 billion created 106,000 new jobs.

Note how much of this runs contrary to the conventional wisdom which holds that innovation, especially when applied to the production process, throws people out of work.

Unfortunately, that myth lingers all too hard in our society.

Salter, a British economist addressed this question directly. In a survey of some 14 British industries, he found that productivity increases often lowered costs by reducing the per-unit labor content.

However, this did not lower employment. The reduced costs resulted in increased sales which created a demand for more workers. Indeed, the rate of increase in sales was so much larger than the drop in per-unit labor content that each 10-percent increase in productivity produced a 6-percent increase in employment.

Despite the fact that technological innovation can secure such large benefits for society, despite the fact that small businesses secure those benefits out of all proportion to their size, the rate of creation of those small businesses has fallen dramatically over recent years.

From 1964 to 1974, the number of new public issues for small high technology companies dropped from 204 to 4—and the dollar value for those new issues dropped from $349 million to $6 million.

Even more tragic is the fact that in the first half of 1975—the last year for which I have data—there was not a single new issue for a small high technology company.

Do we have a problem?

The initial input to the study is to come from the private sector—from business, labor, public interest groups, and academics.

The business portion will involve the leaders of some of our most innovative large firms; and members of the venture capital industry, successful small business leaders, and those who are trying to become successful leaders of small businesses.

Their task is not to have a mass gripe session about what they think is wrong with Government. They have the specific task of focusing positively on Government and innovation.

Specifically, they are being asked to answer the question: "What options are open to the Federal Government that will encourage industrial innovation in the United States at minimum cost to society and without sacrificing other national goals?"

We are not looking to them for unfounded advice or for vague generalities. We are asking them to bring the weight of their own experience to the problem, to present data, relate anecdotal evidence, demonstrate their conditions with respect to actual decisions made in firms in their industries, and otherwise exercise a judicious approach to the question.

Despite our constraints and the extremely short timetable, we have had a marvelous response from the private sector.

Over 300 senior executives from businesses, both large and small, have volunteered to work.

Their response demonstrates clearly the perception in industry that a collaborative approach to this problem can generate a solution.

We are particularly impressed that executive from small firms—executives with small staffs and enormous time pressures—have responded with enthusiasm.

Mr. Chairman, I can go on for hours about my favorite subject, but the study's results will speak louder than my words.

We are committed to the industrial development of the United States and recognize the critical role that technological innovation and the small business community play in that development.

We are also committed to exploring how the government can influence and encourage that development in the public interest.

Mr. Chairman, that ends my prepared testimony. I shall be glad to answer any questions the commitee may have.

Senator McIntyre. Well, thank you for that fine presentation.

Your full text will be made a part of the record, without objection.

(The prepared statement of Dr. Baruch follows:)

I WANT TO STRESS THAT UNTIL A NEW METHOD, PRODUCT, OR SERVICE ACTUALLY IS USED, UNTIL IT DIFFUSES THROUGHOUT SOCIETY, THE INNOVATION PROCESS HAS NOT BEEN COMPLETED. AN INVENTION--AS OPPOSED TO AN INNOVATION--MAY BE AN INTELLECTUAL TOUR DE FORCE, BUT IT IS ONLY THE FIRST PART OF THE INNOVATION PROCESS. UNTIL IT IS USED, UNTIL IT SPREADS AND SERVES SOCIETY'S NEEDS, IT IS NOT AN INNOVATION.

THIS REQUIREMENT FOR USE AND DIFFUSION MEANS THAT BUSINESS PLAYS A CENTRAL ROLE IN CONVERTING INVENTIONS INTO INNOVATIONS. IT FALLS TO BUSINESS, LARGE OR SMALL, TO MAKE THE INVESTMENT NECESSARY TO DEVELOP AN INVENTION, PRODUCE IT, DISTRIBUTE IT, AND INFORM THE PUBLIC OF ITS AVAILABILITY. SOME APPRECIATION OF THE SIZE OF THAT TASK, AND OF THE GULF THAT MAY EXIST BETWEEN INVENTION AND INNOVATION, CAN BE GLEANED FROM SOME VERY APPROXIMATE FIGURES FROM THE CHEMICAL INDUSTRY. THE BASIC LABORATORY PROJECT LEADING TO AN INVENTION OR TO THE PROPOSAL FOR A NEW PRODUCT MAY COST AROUND $50,000. THE SCALE-UP STAGE TO SEE IF THE LABORATORY RESULTS CAN BE EXTENDED COSTS AROUND TEN TIMES THAT, OR $500,000. THE PILOT PLANT, TO TEST WHETHER THE PRODUCT CAN BE MADE IN COMMERCIAL QUANTITIES AT THE RIGHT PRICE COSTS ABOUT TEN TIMES THAT OR $5 MILLION. LASTLY, IF ALL GOES WELL, THE FINAL PLANT AND DISTRIBUTION SYSTEM FREQUENTLY HAVE A PRICE TAG TEN TIMES GREATER STILL, OR $50 MILLION.

WILL THE RETURNS PAY BACK THE COSTS OF OUR LAST SIX LOSERS?
WILL THE GOVERNMENT LET US MAKE IT?
WILL THE GOVERNMENT LET US SELL IT?
CAN I GET MY MONEY OUT?
AND SO ON.

THE NAME OF THIS INVESTMENT GAME IS RISK TAKING. IT IS SMALL WONDER THAT THERE ARE SO FEW PLAYERS! FOR THOSE WHO HAVE THE SKILLS TO ANALYZE THE LIKELY RESULTS, FOR THOSE WHO HAVE--OR CAN MUSTER--THE RESOURCES TO BACK THEIR JUDGMENT, FOR THOSE WHO HAVE THE STOMACH TO PLAY THE GAME TO THE END, THE REWARDS CAN BE GREAT. FOR SOCIETY THEY ARE GREATER STILL. IN THE YEARS FROM 1969 TO 1974, FOR EXAMPLE, A SERIES OF LARGE INNOVATIVE FIRMS EXPERIENCED SALES GROWTHS OF 13.2% WHILE A SIMILAR SERIES OF MATURE FIRMS GREW 11.4%. DESPITE THE SIMILARITY IN THEIR SALES GROWTHS, THE EMPLOYMENT IN THE MATURE FIRMS GREW ONLY 0.6% WHILE THAT IN THE INNOVATIVE FIRMS GREW BY 4.3%--OVER SEVEN TIMES AS MUCH! TECHNOLOGICAL INNOVATION IN INDUSTRY NOT ONLY PROVIDES NEW PRODUCTS AND SERVICES TO ADVANCE OUR SOCIETY'S QUALITY OF LIFE; IT NOT ONLY REDUCES THE COST OF EXISTING PRODUCTS AND SERVICES--OFTEN WHILE IMPROVING THEIR QUALITY; IT ALSO SERVES AS A MAJOR, NONINFLATIONARY SOURCE OF NEW JOBS.

QUESTION DIRECTLY. IN A SURVEY OF SOME 14 BRITISH INDUSTRIES, HE FOUND THAT PRODUCTIVITY INCREASES OFTEN LOWERED COSTS BY REDUCING THE PER-UNIT LABOR CONTENT. HOWEVER, THIS DID NOT LOWER EMPLOYMENT. THE REDUCED COSTS RESULTED IN INCREASED SALES WHICH CREATED A DEMAND FOR MORE WORKERS. INDEED, THE RATE OF INCREASE IN SALES WAS SO MUCH LARGER THAN THE DROP IN PER-UNIT LABOR CONTENT THAT EACH 10% INCREASE IN PRODUCTIVITY PRODUCED A 6% INCREASE IN EMPLOYMENT!

DESPITE THE FACT THAT TECHNOLOGICAL INNOVATION CAN SECURE SUCH LARGE BENEFITS FOR SOCIETY, DESPITE THE FACT THAT SMALL BUSINESSES SECURE THOSE BENEFITS OUT OF ALL PROPORTION TO THEIR SIZE, THE RATE OF CREATION OF THOSE SMALL BUSINESSES HAS FALLEN DRAMATICALLY OVER RECENT YEARS. FROM 1964 TO 1974, THE NUMBER OF NEW PUBLIC ISSUES FOR SMALL HIGH TECHNOLOGY COMPANIES DROPPED FROM 204 TO 4--AND THE DOLLAR VALUE OF THOSE NEW ISSUES DROPPED FROM $349 MILLION TO $6 MILLION. EVEN MORE TRAGIC IS THE FACT THAT IN THE FIRST HALF OF 1975--THE LAST YEAR FOR WHICH I HAVE DATA--THERE WAS NOT A SINGLE NEW ISSUE FOR A SMALL HIGH-TECHNOLOGY COMPANY.

EVEN FOR OUR LARGER FIRMS, THE DROP IN SIGNIFICANT NEW TECHNOLOGICAL ADVANCES HAS BEEN SEEN BY WRITER AFTER WRITER, BY SCHOLAR, BUSINESSMAN, AND GOVERNMENT OBSERVER ALIKE. SPECIFIC DATA ARE HARD TO COME BY, BUT THE PERCEPTUAL EVIDENCE

SECTOR, AND BECAUSE THERE IS A CLEAR NATIONAL IMPERATIVE FOR ITS ATTAINMENT, WE FACE A NEW OPPORTUNITY FOR DEVELOPING A RATIONAL SET OF FEDERAL POLICIES THAT WILL ENCOURAGE EFFECTIVE TECHNOLOGICAL INNOVATION IN THE PRIVATE SECTOR. THOSE POLICIES INVOLVE ALMOST EVERY ASPECT OF GOVERNMENT. HENCE, DEVELOPING THEM AND INTEGRATING THEM INTO A CONSISTENT STRATEGY IS A COMPLEX AND WIDE-RANGING TASK. WHAT WILL ENCOURAGE INNOVATION IN SMALL FIRMS MAY ONLY GENERATE WINDFALL PROFITS FOR INVESTORS IN LARGE FIRMS. WHAT WILL ENCOURAGE INNOVATION IN HIGH-TECHNOLOGY FIRMS MAY HAVE NO IMPACT ON MORE MATURE ONES. POLICIES THAT ENCOURAGE INNOVATION IN RESPONSE TO DOMESTIC DEMAND MAY HAVE LITTLE IMPACT ON OUR INTERNATIONAL TRADE POSITION.

SINCE THE PROBLEM IS SO COMPLEX, PRESIDENT CARTER HAS DIRECTED THAT THE SECRETARY OF COMMERCE CONDUCT A WIDE-RANGING INTER-DEPARTMENTAL STUDY TO DEVELOP THE POLICY OPTIONS--AND THEIR IMPLICATIONS--THAT THE ADMINISTRATION CAN USE TO ENCOURAGE INDUSTRIAL INNOVATION IN THE NATIONAL INTEREST. THE SECRETARY HAS ASKED ME, AS THE CHIEF SCIENCE AND TECHNOLOGY POLICY OFFICER IN THE DEPARTMENT, TO UNDERTAKE, WITH HER SUPERVISION, THE DESIGN AND CONDUCT OF THAT STUDY. THE STUDY WILL FOCUS ON WHAT FEDERAL OPTIONS ARE AVAILABLE FOR ENCOURAGING INNOVATION AT THE LEVEL OF THE INDIVIDUAL FIRM--LARGE OR SMALL, NEW OR ESTABLISHED.

WITH RESPECT TO ACTUAL DECISIONS MADE IN FIRMS IN THEIR INDUSTRIES, AND OTHERWISE EXERCISE A JUDICIOUS APPROACH TO THE QUESTION. DESPITE OUR CONSTRAINTS AND THE EXTREMELY SHORT TIMETABLE, WE HAVE HAD A MARVELOUS RESPONSE FROM THE PRIVATE SECTOR. OVER 300 SENIOR EXECUTIVES FROM BUSINESSES BOTH LARGE AND SMALL HAVE VOLUNTEERED TO WORK. THEIR RESPONSE DEMONSTRATES CLEARLY THE PERCEPTION IN INDUSTRY THAT A COLLABORATIVE APPROACH TO THIS PROBLEM CAN GENERATE A SOLUTION. WE ARE PARTICULARLY IMPRESSED THAT EXECUTIVES FROM SMALL FIRMS--EXECUTIVES WITH SMALL STAFFS AND ENORMOUS TIME PRESSURES--HAVE RESPONDED WITH ENTHUSIASM.

ONE PARTICULAR OPTION AREA--PATENTS AND INFORMATION POLICY--SHOULD BE MENTIONED BRIEFLY. QUESTIONS CONCERNING THE FUNCTIONING OF OUR PATENT SYSTEM, COMMERCIAL EXCLUSIVITY OF PATENT RIGHTS AND ITS RELATIONSHIP TO SMALL BUSINESS FORMATION, AND A HOST OF SIMILAR QUESTIONS WILL BE ADDRESSED. I HAVE LITTLE DOUBT THAT MUCH OF THE INFORMATION WE RECEIVE WILL BE OF VALUE TO THE COMMITTEE ON INTELLECTUAL PROPERTY AND INFORMATION (CIPI) AS THEY CONSIDER THEIR RECOMMENDATIONS ON THE TREATMENT OF PATENTS RESULTING FROM GOVERNMENT-SPONSORED RESEARCH. THIS LATTER QUESTION HAS NOT BEEN INCLUDED IN THE OVERALL STUDY BECAUSE OF CIPI'S CURRENT ACTIVITIES, BUT IT IS CLEARLY RELEVANT TO THE QUESTION OF TECHNOLOGICAL INNOVATION.

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Senator McIntyre. Would this be a good time to inform the two committees, the Small Business Committee of the Senate and the Small Business Committee of the House, on how you plan to organize the Presidential review of technology policy?

Dr. Baruch. Yes, sir, I can do that verbally, or if you would like, I could submit it for the record.

Senator McIntyre. Why don't you give us a once over quickly orally, and then submit for the record in some detail.

Dr. Baruch. All right.

The first stage will be a series of sessions with business leaders, academic leaders, in the field of innovation, labor people, and public interest groups, on what they see as to the potential for Government facilitation on innovation.

After they come up with their reports, indeed while they are coming up with their reports, each individual agency will be asked to inventory what it is doing in terms of how their programs impact on innovation, and what their potential is to facilitate innovation.

The groups will then come together in joint seminars, and incidentally up to and including the joint seminars, the study will be run as a public process.

We welcome the interest from Members of the Congress and from their staffs and look to their contribution to the process.

After these seminars, a series of task forces will review and come up with a set of options, including what they cost and including what segment of business they will most stimulate.

It is important to note that by "stimulation," we do not mean we will be presented to the President, hopefully by April 1 of next year. vation in small firms. We want to have minimum undesired side effects and costs.

These options will be looked at in a review process, and then they will be presented to the President, hopefully by April of next year.

The process has been drastically shortened. It was originally seen as a 14-month process.

Senator McIntyre. You probably just heard Professor Morse ask why we can't get at it right away—"why do we have to wait for a year and a half?"

Dr. Baruch. We can get at any problem right away in a piecemeal fashion.

Senator McIntyre. What about the recommendations, of the OMB report, of March 1977, for example, recommendation No. 1 is not that one where we could have speedy implementation. Is it not possible for the Federal agencies to develop formal programs which will encourage increase of Federal R. & D. awards to small technology based firms?

Dr. Baruch. I come here as an inventor from a small technology firm, I think that is a great idea, and I think we can encourage the agencies to submit such formal programs to OMB.

Senator McIntyre. That would be very helpful to get that in place.

I would like you, for the record, if you will, to place your work plan in the record.

Dr. Baruch. Yes, sir.

[The document follows:]

Process Overview

The Domestic Policy Review of Industrial Innovation (DPR) will span a period of 10 months, will involve some 30 Federal departments and agencies, and will be assisted considerably by representatives of academia, labor, the private sector, and the public interest. The end product will be a strategy paper integrating the various options and a series of option papers. Together, they will help the President to focus on those aspects of industrial innovation which he believes most significant, and to structure the specific strategies which he believes most consistent with national needs. This draft work plan describes how this is to be done. The detailed approach is set forth in the appendices which follow. This approach has been developed with a view toward the principles and assumptions presented below:

- The subject of the DPR is industrial innovation -- the process of translating an idea into successfully commercialized new processes and products. While it is recognized that the general health of the economy and the overall profitability of firms affect the level and nature of innovation, the DPR will be confined to the development of policies and programs which focus specifically on the innovation process.

- The purpose of this DPR is to develop options designed to have a positive impact upon industrial innovation in the context of other national goals.

- The impacts of Federal programs and policies upon industrial innovation for the most part have been cumulative and unintended byproducts of programs and policies designed to achieve other ends. The DPR process must increase the awareness of Federal agencies as to the positive and negative impacts on industrial innovation that they produce. In the case of negative impacts, it must help them generate creative approaches to ameliorating the situation without compromising their primary mission goals.

- The impact of the Federal Government upon industrial innovation is indirect. Innovation takes place at the firm level. As a consequence, the options developed must reflect an understanding of firms' operations and of the specific incentives and disincentives which influence corporate decisions and abilities to innovate.

- If any changes in Federal policy are to result, recommendations must be based upon convincing and reliable information evidencing the specific impacts of existing

recognized that different agencies may have different perspectives on both the issues at hand and on the desirability of specific options. When consensus cannot be reached, the different points of view will be indicated in the final papers.

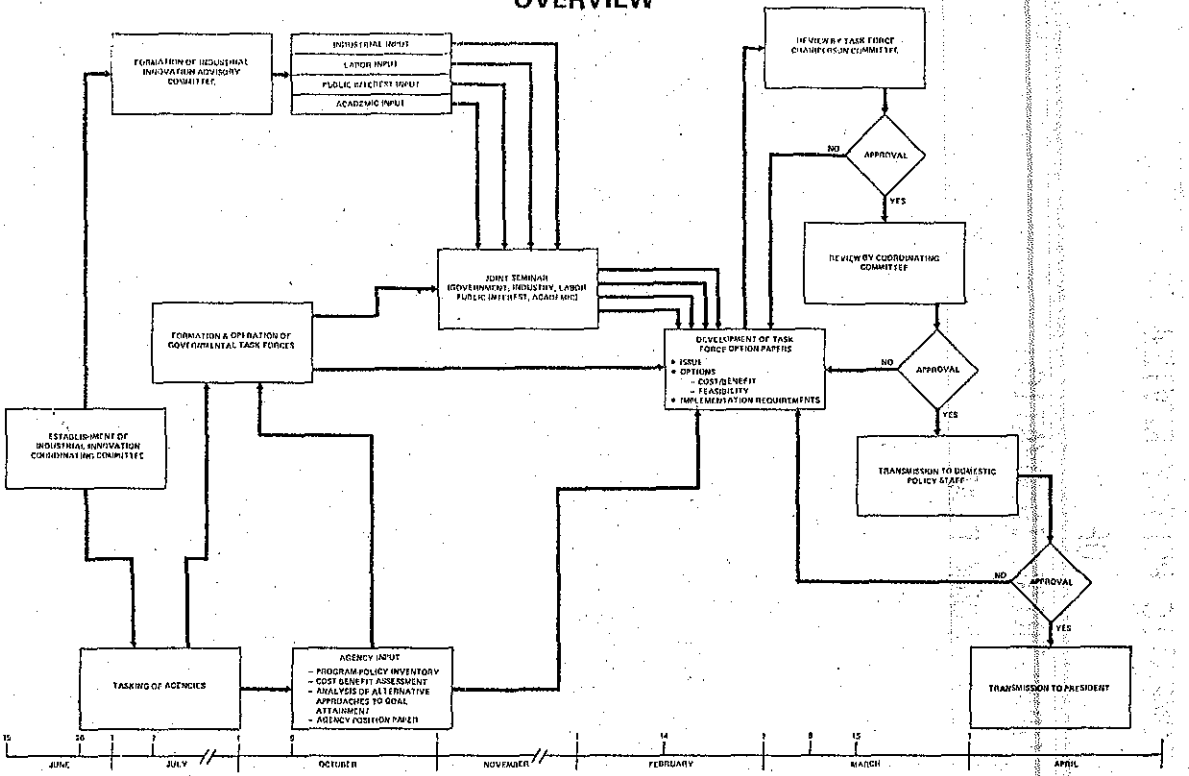
The above principles are reflected in a straight forward work plan, the management of which is facilitated by organizing the review into five issue/option areas:

- o Economic and Trade Policy
- o Environmental, Health, and Safety Regulations
- o Federal Procurement and Direct Support for Research and Development
- o Patents and Information
- o Regulation of Industry Structure and Competition

The work plan of the DPR involves the following groups in the following tasks.

- o The Industrial Innovation Coordinating Committee, a Cabinet level task force chaired by the Secretary of Commerce provides overall policy guidance to the effort and is responsible for approving the final option papers for transmittal to the President.
- o The Steering Committee, a subgroup of the Coordinating Committee, oversees the progress of the study on a regular basis.
- o An Advisory Committee is being established in accordance with the provisions of the Federal Advisory Committee Act and is responsible for setting forth the views and recommendations of business, labor, public interest groups, and the academic community with regard to the eight specific issue/option areas. The work of the advisory committee will be carried out by issue-specific subcommittees. An executive committee is responsible for integrating the work across the subcommittees. This work

WORK PLAN, DOMESTIC POLICY REVIEW ON INDUSTRIAL INNOVATION
OVERVIEW



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Introduction

Industrial innovation is integrally related to the rate of real economic growth, inflation, employment, the balance of trade, and to the ability of society to realize many other national goals. It affects the health of the economy and attainment of other national goals through the commercialization and diffusion of new processes and products.* Process innovations increase the average worker's productivity, decrease the price, and/or improve the quality of the product through improvements in production methods and equipment, more efficient utilization of energy and raw materials, and less expensive and more adaptable materials. Product innovations increase the value of the product to the consumer and to society through improvements in product quality and the introduction of new products. Both types of innovation result in an increased demand for the product in domestic and foreign markets.

Industrial innovation is a process. It proceeds from an idea, through research, development and demonstration phases, to the commercialization and diffusion of a new product or process through the market. Research, development, and demonstration (RD&D) are integral parts of the process insofar as they lead to and evidence the commercial utility of a process or product change or invention. However, RD&D makes no economic contribution to industry unless at least some part of the knowledge generated is successfully commercialized; i.e., unless it is either integrated into the production process or manifested in the form of a new or improved product.

In the United States, innovation depends upon actions of individual firms and occurs at the firm and not at the industry level. Industrial innovation requires the confluence of a firm's ability to innovate and its decision to innovate. The ability to innovate is related to such things as technical expertise and capital availability. The decision is based upon such additional factors as expected rate of return, the opportunity cost of capital, the perceived social acceptability of the innovation and the likelihood of future regulation, the percentage of the firm's resources to be risked, and the propensity of the decision-maker to take risks. For the Federal Government to influence the process of innovation it, therefore, must affect either the ability or the decision at the firm level.

*The separation between product and process innovation is rarely clear. One firm's product, e.g., machine tools, is often another firm's process. In this study the term process innovation refers only to those decisions of the firm that have an internal impact upon the operations of goods and/or services by the firm.

Federal Policy And Industrial Innovation

Strategy Statement

The goal of this Domestic Policy Review (DPR) is to present the President with highly focused options which clearly indicate their impact on target sectors, the cost to the government, and any windfall gains for others. The aim is to enable the President to forge a coherent strategy to influence the rate and direction of industrial innovation in specific industrial sectors or specific types of firms for particular purposes. For example, the President may wish to encourage the formation of, and increase innovation by, small, high technology firms because of their significant contributions to employment growth; he may wish to stimulate product innovations in early product life cycle firms because this may yield a competitive edge in many export areas; he may wish to stimulate process changes in particular industrial sectors because of their potential contribution to reducing inflation; he may wish to stimulate increased efforts to develop advanced technologies which are receiving high priority support by foreign governments because of the implication for the future competitiveness of U.S. industry.

To achieve this goal, the options developed must be precisely targeted. They must focus upon specific problems in the industrial innovation process, and we must clearly understand the particular types of business, industrial sectors, and types of innovation that will be affected directly and the windfalls that may result. In addition, the on- and off-budget costs to the government must be evaluated.

We are accustomed to evaluating benefits and cost. Target and windfalls are less familiar terms. As an example, the current efforts to reduce the capital gains tax in order to facilitate the raising of capital by small and new businesses would produce a significant windfall to (and concomitant loss of tax revenues from) a wide range of other investors. On the other hand, a focused option might:

- o Provide special treatment of founder's stock investments to aid start-ups.
- o Provide special treatment of Regulation A stock to aid small, young businesses.
- o Gear a capital gains rate to the size of the business (sales, capital etc) at the time of investment to benefit small, albeit not necessarily new, companies.

A similar set of target and windfall considerations arise in the area of patent policy. For example, the suggestion has been made to give contractors full title to patents developed with

The particular characteristics of innovation which have been initially identified as being of concern in formulating and assessing focused options are:

- o factor use of innovation, ranging from people-embodied innovations to capital-embodied innovations;
- o kind of innovation, ranging from process innovation to product innovation.

There certainly are other classifications but these are essential in evaluating options by target. We have already discussed size. We can briefly review the importance of the other dimensions and their impact on the option evaluation and option creation process by examples.

- Span of target firms

  Tax laws governing the treatment of expenses for R&D performed overseas influence investment decisions in innovation by multinationals but have little or no effect on domestic firms. Conversely, control of domestic DNA research affects local firms while leaving multinationals with an alternative strategy.

- Degree of Vertical Integration

  The degree of vertical integration of a firm may be an important determinant of the impact of a given policy or program upon competition. For example, regulations designed to pull process changes may be of particular benefit to integrated firms having an opportunity not available to others to integrate a multiplicity of functions and, thereby, to comply with the regulations.

- Market target of firms

  The stimulation of innovation to enhance exports may require a different strategy than that adopted to promote domestic sales. For example, directly supported development of textured soybean protein products could aim at Oriental, Arabian, and other markets. Similarly, international patent policy options, tax incentives for foreign market research, and a U.S. clearing house for information about foreign market characteristics could all encourage innovation aimed at exports over those aimed at domestic markets.

Alternative strategies might be to focus such support on the needs of disaggregated industries or to focus such support on the advantage of basic, cross-cutting technologies which even concentrated industries do not perform but which would be of benefit to many industrial sectors. An example of the latter would be support for work on plastic/carbon fiber composites, joining technologies, and corrosion. The benefits of such work might accrue to a wide range of industries and hence would generally not be significantly supported by any single industry.

- Factor use of the innovation

  Substantial research has shown that a major share of our GNP growth comes from people-embodied innovation (e.g., the development of quantitative skills in managers, new work-force training methods, etc.) as opposed to capital-embodied innovations such as new equipment. Options such as investment tax credits encourage the latter type while new options will have to be created if the former is to be the target.

- Kind of innovation

  Government procurement policies which establish specifications and guarantee a sufficient market for improved products could directly pull product innovations which in turn may benefit both the government and the consumer while providing a competitive advantage to domestic producers competing with foreign industry. Process innovations may result from the establishment of a joint government-private sector collaborative R&D program which focuses on the development or refinement of specific advanced technologies which underlie several industries.

While there are no doubt other important characteristics, the above form a minimal set that requires identification. A coherent, innovation-enhancing strategy for the Administration should mesh well with our industrial growth plans and should, in addition, permit the President to evaluate the political effect of each option. In order to accomplish both of those tasks, each option must not only be formulated precisely in terms of the types of firms, specific industries, and kinds of innovation affected; it must also include:

o An assessment of on-budget, off-budget, and other costs associated with each option.

Process Overview

programs and policies upon innovation, and indicating how particular changes in policies and programs will result in increased innovation. Therefore, this DPR process will offer the private sector the opportunity to illuminate the corporate decision-making process to specify particular recommendations which will induce greater innovation, to document the negative impact of specific Federal policies and programs upon innovation, and to demonstrate the benefits which will accrue to the firm and society from recommended changes.

- The wide range of policies and programs under consideration, and the myriad of national goals which they affect, requires the DPR process afford representative of labor, the public interest, and the general public an opportunity to present their considered points of view on the issues along with their recommendations for action and their perspective on the recommendations of the private sector. Any recommendations must also be reflective of the state of research-based knowledge on industrial innovation. Experts from the academic community therefore, will participate in the process.

- The variance in points of view among the private sector, labor, public interest, and government communities requires that the process afford an opportunity for interaction among the groups.

- The DPR process is to result in an advisory document for the President. As a consequence, the DPR will proceed in two phases; a public information gathering phase, and an option development and assessment phase conducted privately within the Executive Branch.

- The output of the DPR is to be a set of specific, carefully analyzed options which can be seen by the President as combining to form a set of strategies enabling the government to influence industrial innovation at a minimum cost to the government while pursuing other national goals. Each option therefore, will be analyzed to determine its likely beneficial impacts upon innovation at the firm and industrial sector level, its on- and off-budget costs, its effects on competition, and the feasibility of its implementation. In addition, it will require a careful integration of the work of multiple task forces to develop an understanding of the singular and combined impact of the various options upon both industrial innovation and other national goals.

- The final option papers transmitted to the President need not be consensus documents. It is

will be completed in January, 1979 at which time the Advisory Committee will expire.

o Federal Departments and Agencies will assess the impact of their existing programs and policies upon industrial innovation concurrently with the work of the advisory committee. They will develop positions regarding the feasibility and merit of adopting alternative approaches to the attainment of their mission objectives which have a more positive impact upon industrial innovation. This work will be completed in October 1978.

o Joint Seminars in each issue/option area will be held in November. Representatives of labor, academia, the private sector, the public interest, and the Exectutive Branch will participate. After the exchange of views, the position papers of the advisory committee and of the Federal agencies will form the starting point for the work of the interagency task forces.

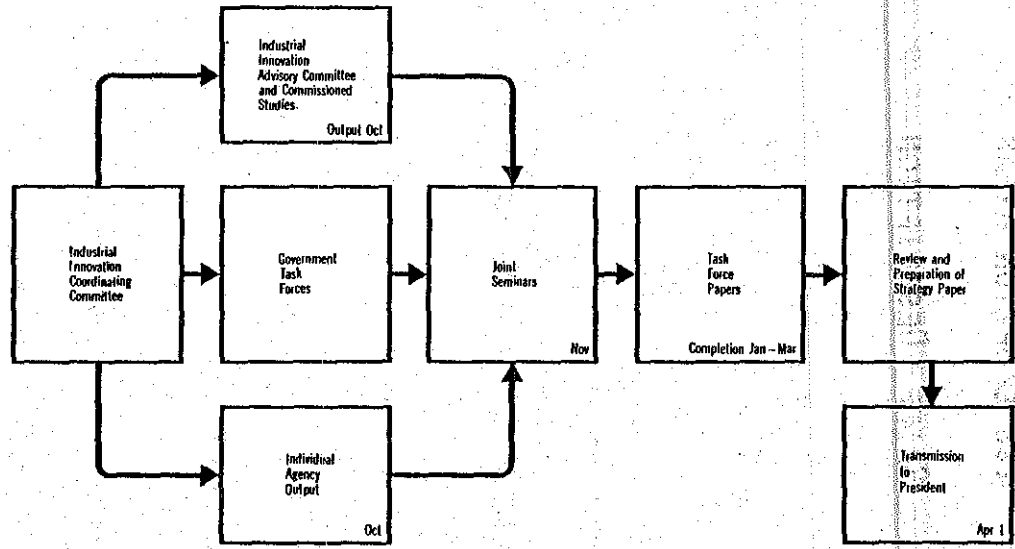
o Interagency Task Forces, organized in the same areas as the advisory committee subcommittees, will be established. Each will focus upon its specific issue/option area and will be responsible for the definition of issues and the development and analysis of specific options. Each task force will be comprised of representatives of Federal agencies with particular interest in and responsibility for the issues of concern to that task force. The work of the task forces will be completed by March 15.

o The Task Force Executive Committee, an Assistant Secretary level committee comprised of the chairpersons of the interagency task forces will coordinate the work of the task forces and assure the integration of this effort. The Task Force Executive Committee will meet with the Steering Committee and with representatives of other agencies as appropriate.

o The Integrating Staff, under the direction of the Assistant Secretary of Commerce for Science and Technology, will be responsible for the day-to-day management of the entire effort and will serve as the primary staff responsible for integrating the work of the task forces on behalf of the Task Force Executive Committee. Other key agencies are urged to assign senior policy analysts to serve as members of this staff.

o The Steering Committee and Coordinating Committee will review the output of the task forces and, as noted, are responsible for recommending transmittal of the final option papers to the President no later than April 1, 1979.

Work Plan, Domestic Policy Review On
Industrial Innovation Overview



Issue/Option Areas

Brief Description

This section is comprised of brief descriptions meant only to suggest the range of concerns subsumed under each issue/option area and to illustrate the type of focused options which might be considered by the Advisory Committee and Interagency Task Forces. It is assumed that, during the initial phases of the Advisory Committee work, close attention will be paid to the precise formulation of concerns within each area and to a specification of associated priorities. To assist in this process, unbiased and structured analyses will be commissioned. Based upon these analyses, the work of the Advisory Committee, and the Federal department and agency reviews, the issues will be further refined, and the priorities of the Task Forces will be set. A final determination of the specific issues to be addressed by each interagency Task Force will be made by the Steering Committee together with the Task Force Executive Committee. The Steering Committee will continue to exercise close supervision of the focus of the DPR effort.

It should be recognized that solutions to problems arising in one issue/option area may be found in another issue/option area. For example, regulations which delay the marketing of new drugs, thereby substantially reduce the economic life of a patent. The solution may be found in a change in the operation of the patent system. Other examples of the interrelationships between the Task Forces are found in the illustrative examples contained in the following pages. The integrating staff will monitor the work of the Task Forces on an ongoing basis and assure that the work of the Task Force is appropriately integrated.

International and trade policy is of concern to this DPR strictly from the point of view of its effect upon industrial innovation in the United States. The concerns include the promotion of export-targeted innovation; the harmonization of international standards and patent policy; international technology transfer issues; the assessment of countervailing duties (in response to foreign subsidies of industrial research and development activities); and the development, assessment and documentation of information regarding such foreign R&D activities. In developing options for consideration, careful attention should be paid to the work completed or being undertaken in the context of the Export Policy Task Force. In addition, careful consideration should be given, in the context of the cost/benefit assessment, to the likley foreign reaction to any particular option.

Illustrative of the types of options which might be developed are: the establishment of mechanisms with developing countries to promote private sector industrial research and development linking them with U.S. firms; the promotion of international agreements to provide for other-country certification of national testing laboratories; the identification of foreign market opportunities and the direct support of innovation aimed at the development of export products for such markets; and, the development of an integrated information system to provide U.S. industry with current knowledge regarding the direction and focus of foreign industrial R&D efforts, critical performance characteristics in foreign markets, and foreign country product standards and certification procedures.

Federal Procurement and Direct Support of R&D

This committee/task force will deal with the total system of federal procurement for goods and services and the full range of federal support for R&D.

Of particular concern in the federal procurement issue/option area are such things as the strengthening of interagency coordination in procurement through planning, standards, and the development of information systems which relate government demand to civilian innovation; enhancing programs designed to promote civilian impact of government purchasing for defense and aerospace systems; developing, implementing, and evaluating new methods for anticipating and responding to differences in civilian and government needs and markets; and designing particular procurement practices which will directly pull innovations. In spanning this range, careful consideration must be given to the characteristics of those cases where government procurement has been stimulative, to differences between government and private needs and markets for products, and to the managerial exigencies of procurement systems.

Illustrative of the specific options that might be considered are: The use of performance specifications to promote competitive development among suppliers and thereby pull innovation in the contest of guarangeed federal markets for the new product; enhanced interaction between government procurement and technical personnel, to design specifications and to evaluate proposals from the point of view of cost and performance characteristics; the selective aggregation of markets across federal agencies and between levels of government to provide increased innovation incentives; an expanded use of multiple procurement for prototype development to promote competition through the demonstration phase and to facilitate evaluation of alternative designs; provision of incentives to encourage a coupling of the R&D and supplier firms in the development of new products; and a streamlining of procurement procedures to facilitate small business competition for high technology product procurement contracts.

It is recognized that government patent policy affects the relationship of procurement to innovation. Government patent policy issues are being addressed by the interagency Committee on Intellectual Property and Information.

Patents and Information

Patents

Patent policy has three aspects: Government policy with regard to inventions made (1) by its employees; or (2) with its support; and (3) purely private inventions. The first two aspects are not within the jurisdiction of this DPR. They are being considered in a parallel effort by the Committee on Intellectual Property and Information (CIPI) of the Federal Coordinating Council for Science, Engineering, and Technology. CIPI's work is to be completed within six months and will be coordinated with that of the DPR.

The concern with patents embraces strictly private sector issues. For example, the 17-year limited monopoly a patent provides is intended to promote innovation by assuring a period of commercial exclusivity during which the innovator may realize a return on his investment. Many believe this incentive is being undermined in at least two ways. First, courts attach little weight to the Patent Office's issuance of a patent when the patent's validity is later challenged. Second, certain government regulatory efforts, particularly those of the Food and Drug Administration in regard to pharmaceuticals, prevent a patented product from being marketed until it is cleared for public use. This clearance process effectively shortens the useful life of this patent. Illustrative options that might be considered are: In the first instance, introducing a new patent re-examination system to allow the Office to devote additional time to reconsider patents which have been, or which the patentee fears may be, challenged. This would encourage courts to accord greater deference to Patent Office determinations. In the second instance, options include delaying issuance of the patent until pre-market clearances are obtained or not counting against the life of the patent the time consumed by that process.

Information

With regard to information policy, this issue/option area concerns the collection, aggregation, cross-referencing, and dissemination of scientific and technical information across government agencies and between government, the private sector, and the general public. The purpose is to improve the availability and utilization of scientific and technical information relating to policy decisions which affect technological innovation, thus enhancing the ability of the private sector to innovate. Illustrative

Regulation of Industry Structure and Competition

This issue/option area concerns such things as the constraints upon collaborative industrial R&D which retard the generation of both non-proprietary and proprietary knowledge; constraints on joint ventures which might facilitate innovation too costly for individual firms, inhibitions against vertical integration which might facilitate innovation at process interfaces; and constraints on innovation in regulated industries and ensuring reduction in the incentive for innovation in supplier industries. Also of concern is the extent to which large firms are inhibited from innovating in ways which might further expand their market shares to the point that they might become subject to government action.

In developing options in this area, careful attention must be paid to the relationships between concerns for competition, the public interest, and innovation (and its benefit to the consumer and society). Illustrative options which might be considered are: Revision of policies to facilitate collaborative industrial research and development activity in disaggregated industries focused, for example, on basis or environmental technologies; consideration of inducements to innovation resulting from greater competition due to more vigorous enforcement of the antitrust laws; and structuring financial incentives for price-regulated industries which would encourage productivity-related innovation in supplier industries.

Appendices: Process Detail

Coordinating Committee will approve transmission of the papers to the President (completion date, April 1).

In addition, it is assumed that Coordinating Committee Members will address other matters of concern brought to their attention by the Steering Committee, its chairperson, or the Central Integrating Staff.

C 1

Advisory Committee

An Advisory Committee to the Secretary of Commerce is being established pursuant to her role as chairperson of the Industrial Innovation Coordinating Committee and in accordance with the provisions of the Federal Advisory Committee Act. In the following pages the purpose, structure, membership, expected output, procedures, and administrative and staff function of the Advisory Committee are described in detail.

Purpose

In accordance with the President's directive to involve the public in the work of the Industrial Innovation Coordinating Committee; mindful of the need to understand the private sector perspective on the problem and their recommendations for appropriate action; and cognizant of the complexity of the subject being addressed and the diversity of as yet unreconciled points of view; the Advisory Committee will develop position papers and recommendations representing the points of view of: the commercial, industrial and financial communities; labor; public interest representatives; and the academic community expert in the area of industrial innovation. The purpose of each group represented on the Advisory Committee is a generative one: to address the issue at hand in a creative and statesmanlike manner and to set forth considered recommendations for remedial action, cognizant of the Administration's commitment to a range of other national goals.

Structure

A single advisory committee of approximately 125-150 individuals now is being established. The advisory committee will immediately be subdivided into 9 subcommittees. Three large subcommittees will be formed: one each to represent the labor, public interest, and academic communities. Five smaller private sector subcommittees will be formed to address each of the following specific issue/option areas as they affect industrial innovation:

- Economic and Trade Policy
- Environmental, Health, and Safety Regulations
- Federal Procurement and Direct Support for Research and Development
- Patent and Information Policy
- Regulation of Industry Structure and Competition

- The academic representatives must be accomplished scholars who have studied industrial and financial decision-making and the innovation process. As with labor, the membership should include individuals who have addressed each of the issues of concern.

- The private sector representatives will be senior vice presidents or chief executive officers. They will come from a range of firm sizes and will represent industries which have been, or might be, affected by the various policy areas and issues under review. They will be assigned to task forces of greatest significance to their particular industrial sector.

The final selection of members and chairpersons of each subcommittee will be made by the Secretary of Commerce.

Advisory Committee Output

The private sector representatives will address the defined issues. They will focus upon the innovation process and identify as specifically as possible those programs and policies of the Federal Government which influence either their ability or decision to innovate. In so doing, they should present objective and validated data and specific case examples which demonstrate the identified phenomenon. Having identified specific problems, the private sector representatives should produce specific, focused recommendations supported by a quantitative/qualitative analysis demonstrating the extent and direction of the specific benefits which will accrue to the innovation process for particular types of firms operating in particular industrial sectors. In developing position papers, each subcommittee should observe the specific option analysis requirements expressed in the Strategy Statement.

Finally, the private sector Executive Subcommittees will be responsible for developing an analysis which will integrate the output of the five issue/option task forces and will set forth the private sector's priorities with regard to the recommendations emerging from their collective effort.

The Labor Subcommittee will address the following questions:

- What are the specific conerns of labor with regard to innovation, and, given those concerns, what programs and policies might the Federal Government pursue to address these concerns?

The Academic Subcommittee will play a special role. Its members will use their research-based knowledge of the innovation process to clarify issues and to assess the opinions and recommendations of the other groups. They will use their knowledge and expertise to test the other subcommittees' positions, to buttress valid, but insufficiently documented arguments, and to point out errors and inconsistencies, if any, in other subcommittees' work.

The Academic Subcommittee, however, is not limited to responding to the other subcommittees. Its members are encouraged to refine issues and generate options for consideration by the other subcommittees and by the Coordinating Committee and Interagency Task Forces.

Each of the subcommittees' final drafts will be reviewed by the Coordinating Committee and referred for analysis to the specific government task forces concerned with the specific issue addressed or with the development of the particular types of options recommended.

Process

Meetings of the Advisory Committee subcommittees will be convened by their chairpersons, with advance notification of such meetings appearing in the Federal Register. The draft reports of the Private Sector Subcommittees are to be completed and transmitted to the other subcommittees and to the Coordinating Committee by December 15, and those of the other subcommittees by December 31. In turn, the joint seminars will be completed during January 1978 with final, revised papers to be transmitted to the Coordinating Committee within two weeks after the completion of each joint seminar (and in no case later than January 31, 1979, at which time the papers will be referred to the appropriate government task forces for analysis. It is recognized that some subcommittees may complete their efforts well in advance of these dates, in which case the schedule for completion work on their issue/option areas will be accelerated. Upon submission of the final papers to the Coordinating Committee, the charter of the Advisory Committee will expire.

Administrative and Staff Support

Administrative and staff support will be provided to each of the subcommittees by the Department of Commerce and by other agencies and departments participating in the DPR. This will be done in accordance with the provisions of the Federal Advisory Committee Act.

Advisory Committee Process Detail

2. The Committee will meet as often as necessary to perform its functions under the Presidential Directive. It is estimated that the Committee will meet at least twice during the first year.

3. Staff of the Assistant Secretary for Science and Technology will provide clerical and other necessary supporting services for the Committee. Staff will also be provided to the Committee by other federal agencies participating in the study directed by the President.

4. Members of the Committee will not be compensated for their services but will, upon request, be paid travel expenses in the performance of their duties as authorized by the Department of Commerce Travel Regulations.

5. The annual cost of operating the Committee is estimated at $200,000 which includes approximately two fifths of a person-year of staff support.

6. The Secretary may establish such subcommittees from the members of the Committee as she deems desirable. Such subcommittees will function solely as advisory bodies and will comply fully with the provisions of the Federal Advisory Committee Act.

Duration

The Committee shall terminate upon completion of the tasks assigned to it by the Secretary but in any event within two years from the date of this Charter. It is anticipated that the Committee will complete its responsibilities in approximately nine months.

Date:_____ Signed:_____

The Committee will function solely as an advisory body, and in compliance with the provisions of the Federal Advisory Committee Act. Its charter will be filed under the Act, 15 days from the date of the publication of this notice. The Committee will operate through subcommittees of its members.

As mentioned in the Federal Register Notice of June 2, 1978, referenced above, interested persons are invited to submit to the Secretary nominations for membership to the Committee. Such nominations and any comments regarding the establishment of the Committee should be addressed to the Secretary of Commerce, United States Department of Commerce, 14th and E Streets, N.W., Washington, D.C. 20230, and should be submitted by (please insert the date calculated to be 15 days after publication of this notice).

Date:_____ Signed:_____

Assistant Secretary for Administration

- o A preliminary statement of the agency's position with regard to such current, alternative, and additional programs and policies.

The agency papers will be transmitted to the Coordinating Committee by October 15, 1978.

These papers are to be organized in the following manner:

I. Overview of Agency Role in the Innovative Process.

This section should present a summary of the agency's view of its present impact upon industrial innovation and of its potential, future role in enhancing the innovation process. It should indicate the degree of latitude which the agency feels itself to have in specific policy and program areas which would permit a more positive impact upon industrial innovation.

II. Summary of Research Findings.

As developed by studies supported by the department or agency, this section will present a summary of relevant knowledge regarding the industrial innovation process and the impact of Federal policies/programs upon that process.

III. Review of Specific Policies and Programs (by program group)

In this section, the department/agency will present a series of policy and program specific review papers which, for each program/policy judged significant, summarizes its impact upon industrial innovation. This section should be divided into the following issue categories (see p. 19-28 of Work Plan):

1. Economic and Trade Policy
2. Environmental, Health, and Safety Regulations
3. Federal Procurement and Direct Support of R&D
4. Patents and Information
5. Regulation of Industry Structure and Competition

Policies/programs should be organized into the appropriate categories based upon the judgment of the agency guided by the issue area statements in the Work Plan (p. 19-28). The overall analysis of each policy/program should be guided by the strategy statement (p. 5-10) in the Work Plan.

E 1

Joint Seminars

Upon completing their draft papers, the Private Sector Subcommittees will forward them for review to the Public Interest, Labor, and Academic Subcommittees which will complete their draft papers within two weeks. All papers will be immediately reviewed by the Coordinating Committee and by the parallel government task force. A one-day joint seminar, open to the public, then will be held. The participants will include the concerned Private Sector subcommittees and Government Task Forces as well as representatives of the Labor, Public Interest, and Academic Advisory Subcommittees.

The purpose of the seminars is to provide an opportunity for a free exchange of views among the participants and to give interested members of the general public an opportunity to express themselves. The seminars are intended to inform each group of the others' perspectives. They ultimately will provide a basis for the reconsideration of positions by each of the Advisory Subcommittees which in turn will have a two-week period to reflect upon the seminar and to revise their papers for final transmission to the Coordinating Committee.

Input to Task Forces

The task forces will be provided with:

1. The individual Federal Department and agency review papers cross-referenced to indicate both the options and issue statements directly relevant to each task force. This will be accomplished by November 30, 1978.

2. The draft position papers of each of the Advisory Committee Subcommittees cross-referenced as above. This will be accomplished by December 30, 1978.

3. The final Advisory Committee Subcommittee papers. This will be accomplished by end of January 1979.

4. Reports on each of the issue-specific joint seminars.

5. Drafts of all option papers as developed by the other task forces. This will be accomplished by March 1, 1979.

Output

The task force reports will consist of the following: A series of succinct option papers to be preceded by a brief statement providing an overview of the considerations and orientation of the task force, summarizing its findings, and setting forth a recommended set of priorities. Each of the option papers should, to the degree possible, address the points indicated in the attached outline in a way consistent with the Strategy Paper.

The Executive Task Force will prepare a sixth paper which integrates the findings of the five issue specific task forces and develops alternative strategic arrays of policy options in the light of the interrelationship of the specific options and the range of associated impacts which could be elicited through alternative combinations of the policy options.

All task force papers will be completed for approval by the Coordinating Committee and transmission to the President by April 1. Because of legislative calendars and budget cycles, some task forces may require less time.

Membership

Membership in each of the task forces will be drawn from Federal departments, agencies, Executive Branch offices,

Task Force Process Detail

- o National Economy
  - inflation
  - employment
  - balance of trade

VII. Costs

- o On-Budget
- o Off-Budget
- o Other (e.g., windfalls)

VIII. Impact on Attainment of Other National Goals

- o Timing
- o Degree

*IX. Implementation Requirements

- o Instrument
  - legislation
  - executive order
  - reprogramming
- o Approach to Implementation
  - organizational needs
  - administrative needs
  - personnel needs
  - scheduling/sequencing of events
- o Anticipated Blockages
- o Feasibility Assessment

*X. Evaluation Plan

- o Significant Impacts to be Monitored
- o Optimal Design
- o Assessment of Validity and Feasibility

XI. Political Assessment

- o Likely Support
- o Likely Opposition

*As options generate consensus, personnel from the Center for Field Methods will assist each of the task forces in the development of implementation and evaluation plans.

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F 8

Patent and Information Policy	DoC, chair NSC DoD OSTP HEW DoJ SBA
Regulation of Industry Structure and Competition	CEA DoC DoJ FTC Treas DoE SBA
[Social Environment for Innovation]	[Studies will be commissioned to explore the importance and relevance of this subject area. Based upon such studies, a later determination will be made as to the merit of establishing a Task Force to address this issue/option area.]

H 1

Integrating Staff

This policy staff will be located in the Office of the Assistant Secretary of Commerce for Science and Technology and will carry out all responsibilities assigned to it by the Assistant Secretary. It will perform a coordinating and integrating function and will work closely with the Domestic Policy Staff throughout the effort. Its assigned staff members will have responsibility for monitoring the work of each of the advisory subcommittees and of each of the interagency task forces. Each agency on the Steering Committee and on the Coordinating Committee is encouraged to detail a senior staff person to the Department of Commerce to serve as a member of the Integrating Staff. On behalf of the Task Force Executive Committee and the Coordinating Committee, the staff, working with the President's Domestic Policy staff, will be responsible for drafting the "strategic" option paper.

Those are somewhat complicated questions, but to me they are the kernel of where you are going, and I do not know how you will get there in that context.

Dr. BARUCH. To answer that question is just what this study is supposed to do.

The question of criteria had started off very simply, our basic criterion is, "Will it contribute to the industrial development of the United States, to its industrial strength?" So that we can negotiate abroad, for example, as equals, rather than taking some second position at the negotiating table.

Representative BRECKINRIDGE. I think, again, we have already committed the first error.

Why would we surrender superiority?

I would say the superiority would be our objective.

I do not mean to engage in semantics.

Dr. BARUCH. I agree with you. I hope we pass through the equality position, and to one of superiority very rapidly.

We have surrendered a great deal of our superiority in many areas, and a large chunk of it has been because other countries have recognized that there are functions of government which can facilitate the growth of their industrial strength, Japan, for example, in microelectronics and fiber optics, Germany's work in small parts machining is a clear approach by government not to get into business, not to develop things for business, but to develop those things on which business can build its strength, and we have no such programs in this country.

We have not had, at least for the past, well, since the railroad times of the 19th century, such programs.

We have developed an adversary relationship between government and industry, and I think it is time we start taking a look at whether that relationship is beneficial to our country.

Representative BRECKINRIDGE. I cannot do anything but agree with everything you are saying, except, as my friends Senator McIntyre and Professor Morse have said, we have a practice of—almost a policy in Washington—of studying things to death, and I do not believe you are going to re-invent the wheel and discover America a year and a half from now; I think you are going to reaffirm what is already in the public domain, and my question is a real simple one: Why cannot the President very simply constitue your study committee as an ad hoc committee, and go to work now, not just studying, but implementing the voluminous reports that have been developed in detail? Why don't we start a program of implementation? For example, why does not someone just say automatically that if the small entreprenour businessman or firm produces more than half of what we are talking about—at least then half of the costs—that we give him more than half the Federal R. & D. investment?

OMB could set it aside; and if OMB will not set it aside, then why don't you ask us for legislation?

Senator MCINTYRE. Congressman, I think what we could do is ask this panel to not only explore these matters in depth for the future but to implement some of the things that are so obvious right away in the near term. This could be a function of this panel: To pull out these things so you do not have to wait for a year and a half for a magnifi-

mental evil that is frustrating us with the twin problems of inflation on one hand and unemployment on the other; and it is there in the economy, it is not up here in deficit funding; and the quicker you get at it the better, and the sooner a lot of our problems will go over the hill and away.

I thank you very much, and I look forward to working with you.

Dr. BARUCH. If I may get in a plug for both a small New England college and Professor Morse, I might mention that both the Charpie report and the white paper, the Morse report at Commerce, have been used as texts in the course on "Management of Innovation" at both the Tuck School of Management in Dartmouth and in Dartmouth's engineering school. I thought I would get that in.

Senator MCINTYRE. Mr. Bedell?

Representative BEDELL. We have a vote on the floor now, and we will have to run.

I want to only make one comment. I have been following the fishing industry, and I know something about fishing; and big business is beginning to recognize that small business is to their survival.

I would suggest to you they recognize, the same way big fish recognize minnows is to their survival, that they need them to gobble them up, as long as they do not interfere and compete in what they are doing; and I think it is pretty clear as I see big businesses constantly gobbling up small businesses, and surely you are aware of the disappearance of the family grocery store and the corner drug store and all of these sorts of things; so I hope we do not deceive ourselves by thinking that big business will try to help small business and welcome small business, because my experience has been exactly the contrary—that they indeed feel it is fine, as long as it does not interfere with what big business is doing. So I have to run and take the prerogative as a Congressman in trying to make a statement, so you can give your rebuttal to the Senator.

Senator MCINTYRE. I hope you get back.

Dr. BARUCH. I would say there is some difference between the gobbling up of small businesses by large businesses than of the fish analysis. The minnow usually does not get very much out of the deal.

In the case of small businesses that are acquired as acquistions by large businesses, frequently the small businessman does get a great deal out of the transaction. I think that is a significant difference, but, in addition, many small businesses serve as suppliers to the large businesses, and are critical in their importance to the survival of the large businesses.

Senator MCINTYRE. One of your answers to the question on the recommendations of OMB, you indicated off the top of your head you saw no difficulty with them.

If you have any change of heart, or a change of mind, will you let us know?

Dr. BARUCH. I did not say I have no difficulty. I said I thought the appropriate way to implement that, if the President chose to, would be by OMB directive to the agencies, but the choice of implementing that must rest with the White House.

Senator MCINTYRE. The Federal agency should develop a formal plan to encourage R. & D. awards to small technology-based firms—that is in this OMB report.

TESTIMONY

OF

EARL H. HESS

PRESIDENT

LANCASTER LABORATORIES, INC.

BEFORE A

JOINT HEARING OF THE

SENATE COMMITTEE ON SMALL BUSINESS

AND

THE SUBCOMMITTEE ON ANTITRUST, CONSUMER AND EMPLOYMENT,

HOUSE COMMITTEE ON SMALL BUSINESS

ON SCIENCE, TECHNOLOGY AND SMALL BUSINESS

AUGUST 9, 1978

by our company is utilized by national and international clients. A scope sheet attached to this testimony describes our areas of expertise more fully.

I also serve as the Chairman of the Research and Development Committee of the American Council of Independent Laboratories, Inc. (ACIL), Chairman of the Eastern Division of ACIL and as a member of its Government Relations Committee. The ACIL, established in 1937, is a professional association of independent engineering and scientific laboratories. Its membership includes over 200 of the leading testing, materials engineering, research, development and inspection firms in the United States. Almost all of these laboratories are small businesses.

My experience in serving on the Advisory Council of the Pennsylvania Technical Assistance Program (PENNTAP) has enhanced my understanding of innovation in the small business community. PENNTAP, a program of the Continuing Education Division of the Pennsylvania State University, is funded in part by the Pennsylvania Department of Commerce, and represents, I feel, a model of the type of university/private sector program to stimulate innovation and transfer of technology that should be implemented more widely.

Most people, I fear, think of innovation in much too narrow a sense, a major scientific breakthrough leading to an entirely new product or process. My own experience as an innovator has taught me that the basic breakthrough is often the easiest part of a total process -- an ingenious insight, a lucky break, a serendipitous assessment of an unexpected experimental result. But the painstaking effort usually required to convert that breakthrough to a new process or product requires innovative qualities of a different type. Though less glamorous, these efforts are no less important. Process refinement for greatest economic efficiency and development of analytical methods for quality control are only two examples of such follow-up efforts. Slowness or outright failure to deliver the benefits of an innovative breakthrough to the marketplace can often be traced to a failure at one of these latter stages. If we are concerned with innovation, not in some theoretical sense, but rather as it impacts on our nation's economic health, then we must be concerned with the entire chain of events which begins with basic research and ends with a new product or process on-stream.

What is it that is special about small businesses in the innovation process? It is very simply the creative qualities of individuals in the working environment of a

in new business start-ups reinforces this concern. With the climate for new business start-ups so poor, innovative productivity is bound to suffer.

During my 17 years in business, I have witnessed the direct and withering impact of government regulations on the innovation process. In the early years my firm participated in the development of a number of patentable inventions. In recent years, the nature of our work, reflecting the needs and wants of our clients, has changed drastically. Projects aimed at meeting environmental regulations, assessing compliance to OSHA standards, reformulating products to comply with new FDA or USDA regulations are the order of the day. One of our more recent product developments was a controlled release form of copper sulfate designed for its safer and more efficient use in controlling aquatic pests. The active ingredient of this new product has long been recognized as appropriate for aquatic control purposes. However, we lost a year in development time in acquiring an EPA experimental permit to test the safer product in a few lakes. In short, more and more innovative resources are directed to assisting private firms in defensive activities to comply with Federal regulations and new innovation is delayed unduly by overregulation. We share the deep concern of many that social costs of new technology be assessed and understood, but social accountability and progress in innovating should not be mutually inconsistent goals.

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my chances of receiving an award are far less than if I had responded with ten percent of the effort to a solicitation from a private firm. Our company has had the disappointing experience in the last six months of investing several thousands of dollars in preparing two proposals in response to Federal requests for proposals, only to have the RFPs cancelled after the deadline for their submission. If this represents a frequent circumstance in Federal procurement, it places an inexcusable burden on the small high technology firm. Mr. Chairman, something simply must be done to uncomplicate the Federal procurement process and make its procurement personnel more accountable. Otherwise, the government and the public will be the ultimate losers. They will be denied the services of independent laboratories and other technically oriented small businesses which represent a significant national resource.

My laboratory and others like mine face an increasing threat, believe it or not, from competition by the government itself. For example, presently the USDA extension service provides certain technical services to farmers and agribusinesses at little if any cost. While our laboratory retains a USDA certification to perform meat analysis, our clients are able to obtain the service at no cost from a Regional USDA laboratory. Unfortunately, this example is more the pattern than the exception. The innovation process is not stimulated by in-house government laboratories as effectively as outside

my laboratory. Indeed, it severely constrains our ability to pass innovative, but risky ideas on to our clients.

The subject of these hearings is complex - there is no adequate awareness of the impact of Federal procurement policies, tax laws, grant programs, regulatory schemes and other policies on the innovation process. Yet I believe constructive action is immediately possible.

IV. How Can Government Help?

Essential and prerequisite to almost all other Federal activities is the need to develop valid data on the small high technology business community. It is surprising that data have not already been developed. Indeed, various private and government agencies have made attempts using the questions and census approach, but their catalogings are incomplete and of little real value. We have been very encouraged, as a result of recent conversations with NSF officials, by the interest shown in assisting in the development of a meaningful data base, such a base to include an in-depth characterization of the number, size, viability and economic impact of independent technical laboratories. Such information could be extremely valuable to the government in fashioning Federal policies to utilize this resource in meeting national needs.

at insuring all offerors of equal and fair treatment, but I also stand witness to the fact that in most of these areas overregulation has had a directly counterproductive effect. I am not in a position to recommend a means of reorganizing the present regulatory system, but I am here to say that so long as it exists in its present form, small business, especially innovative small business, cannot play a proper role in the national economy.

I would like to emphasize the importance of the Federal government assuming a leadership role in establishing the proper relationship among government, academic and private sectors in the entire process of reducing basic science to the marketplace. The Small Business Development Center legislation recently before Congress illustrates this point.

We all share the basic goals of this legislation. Small manufacturing businesses do need management and technical assistance if they are to survive in our increasingly complex society. The intention to utilize educational institutions almost exclusively as the delivery system for this assistance without adequate and specific plans to involve the private sector in how the SBDCs operate and the relationship of the SBDCs to the small technically oriented business community is a potentially imperfect partnership. There is a compelling logic in using the technical skills of small businesses to

labs so they can be more widely utilized. Government must and should be prepared to innovate to meet this need. ACIL has for many years fought for a national laboratory accreditation system that would provide a method to establish the qualifications of laboratories to perform work in their areas of competence. After an unconscionably long gestation period, the Department of Commerce established a program, the National Voluntary Laboratory Accreditation Program (NVLAP), to accredit laboratories by product by standard. The program was initiated in 1976, and has yet to accredit its first laboratory. ACIL then and now has urged the government to follow the example of other nations and accredit laboratories by nine or ten major classes of technology. A major private initiative is now underway to try to meet the need for a system which accredits labs now - not in the distant future. The importance of meeting this need is that the capabilities of the scientific laboratory community will be established and its role in contributing to innovation and technology enhanced. As with many important national goals, there is a lack of funding for laboratory accreditation. OMB is not prepared to fund NVLAP adequately (less than $1 million in fiscal year 1978) so all governmental agencies, Federal, state and local, who depend on private labs to perform substantial technical services are encouraged to build up in-house capacity or develop ad hoc arrangements for laboratory services which

A.C.I.L. BULLETIN

AMERICAN COUNCIL OF INDEPENDENT LABORATORIES, INC.

The Professional Association of Independent Scientific Laboratories

1725 K STREET, N.W. WASHINGTON, D. C. 20006 (202) 659-3766

Douglas Dies, Editor FALL 1976 Vol. 16, No. 2

ACIL Establishes Research and Development Committee To Recognize Increasing Activity of Member Firms

Technical Innovation - How Do We Foster It? Where Does One Find It?

As part of a society seemingly controlled by big government, big business, big educational institutions, big labor unions, or some balance of power among these, we have come to equate bigness with progress, quality, efficiency, prosperity and all else that we see as good. Yet if one pauses to reflect on our past he soon determines that most of the truly significant accomplishments were realized through the efforts of a very few people, usually working in small groups or alone. Such is particularly true in the field of science and technology. A number of observers have recognized the gradual erosion of our technological innovativeness as our nation's scientists and inventors have been regimented into large R&D centers — this in spite of the fact that they are provided with the ultimate in physical facilities and other resources. Numerous independent studies clearly demonstrate the vastly superior productivity of the private entrepreneur working in a much less structured situation.

Whatever this kind of observation might be saying to society in general, (see Schumaker, "Small Is Beautiful" for broad commentary) it certainly does suggest that scientists working in small independent laboratories have a continuing significant role to play in the solution of our nation's major technical problems (e.g., environment, energy, food). It is indeed gratifying to see government agencies implement small business set-asides for R&D funding and to witness one major government agency (ERDA) sponsor a conference specifically aimed at drawing the small business community into the mainstream of energy research and development. ACIL through its Research and Development Committee will address itself to the interests of the scientist who chooses to pursue his career endeavors within the framework of the small business community, so as to encourage his efforts and to insure his survival.

Earl H. Hess Named Committee Chairman

Earl H. Hess

In response to a need expressed by many member laboratories, ACIL's Executive Committee has established a new Research and Development Committee. Dr. Earl H. Hess, President of Lancaster Laboratories, Inc., Lancaster, PA, was appointed chairman.

ACIL President Conway C. Burton stated that the new committee was formed in recognition of the substantial R&D interests and capabilities within the independent laboratory community. Mr. Burton further noted that an increasing percentage of ACIL's newer members possess R&D interests, thus making the formation of this new committee a timely move in ACIL's continuing efforts to speak to the needs of its membership.

A recent survey of ACIL members showed that nearly half of all the associated laboratories were involved in R&D activities. R&D work constituted from one to 100% of these laboratories' total efforts, and the variety of scientific disciplines involved covered a wide spectrum.

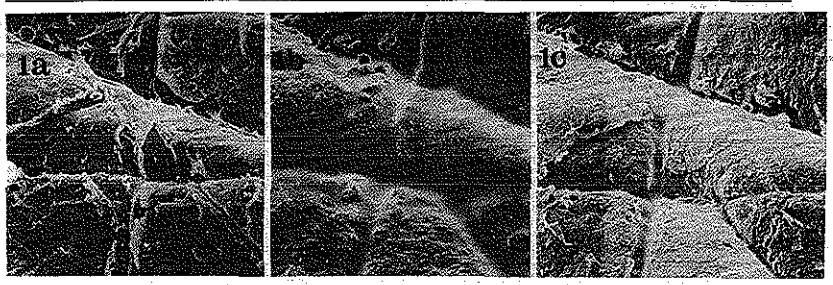
Dr. Hess stated that although his committee will develop its own specific programs, it will also work closely with several other ACIL committees, e.g., Government Affairs and Public Relations. This issue of the ACIL Bulletin represents, in fact, a joint effort with the Public Relations Committee, its purpose being to inform our readers of the broad and solid base of creative technical R&D talent existing within the Council's present membership. Unfortunately space limitations within the Bulletin do not allow its documentation of the R&D capabilities of the total membership.

Dr. Hess has been active in ACIL affairs since his firm joined the Council in 1972. Presently he serves on its Government Relations and FDA - Agriculture Committees. Within ACIL's Eastern Division he serves the joint role of Vice Chairman and Membership Chairman. He earned a B.S. degree (cum laude) in chemistry from Franklin and Marshall College, and his Ph.D. in organic and biochemistry at the University of Illinois.

Dr. Hess is the holder of a number of U.S. and foreign patents and is the author of scientific publications in basic and applied research. Lancaster Laboratories, Inc., which he founded in 1961 reflects, in its offering of services in the agricultural and environmental fields, his technical background and interests.

SPECIAL REPORT	RESEARCH AND DEVELOPMENT

Structure Probe, Inc. to the Aid of the Cosmetics Industry



SEM montages of chapped skin: (1a) before, (1b) after one hour, and (1c) after five hours applying a "moisturizing" lotion. Note the covering of the uplifting layers after one hour and the onset of their reemergence after five hours.

Independent laboratories have a unique history of responding to and satisfying the needs of their clients, particularly in those areas where a direct concentrated approach to specific problems is required. Case in point: Substantiation of product claims for skin products.

Not until the last few years have companies in the "skin treatment business" begun experiencing increased pressure from the public and government regulatory agencies to put the proof of product performance out front. As demand grew for quantitative scientific proof rather than subjective inical evaluation, many companies began turning to outside independent laboratories to provide the answers.

One such laboratory was Structure Probe, Inc. in West Chester, PA, headed by Dr. Charles A. Garber. To meet the needs of this specialized industry, Structure Probe's staff of 20 pioneered a now-accepted procedure to provide the "proof" needed. A multi-step process, it begins with skin replication of an area before and after treatment. Next, scanning electron microscopy (SEM) is utilized to demonstrate the efficacy of the skin care product. Finally, image analysis of the SEM micrographs, done on a $100,000 "Quantimet" image analyzing computer, quantifies the SEM observations.

Structure Probe's proprietory techniques have successfully documented claims not only for skin treatment products, but for facial cleansers, soaps, bath oils, shampoos and shaving products. Such results form the basis for documenting these claims before the myriad of federal regulatory agencies ch as the FTC and FDA and satisfy the nsumers as well.

Equally novel approaches to materials problems have been developed at Structure Probe for problems in metallurgy, microelectronics, polymers, catalysts, and ceramics.

How Good Are The Headlamps In Your Car?

If anyone is able to supply a complete answer to that question, it is probably Industrial Testing Laboratories of Berkeley, CA. This firm, which specializes in the fields of lighting and traffic safety, often finds its clients needing information on headlamp quality for which standard test methods have not yet been developed. By innovative design of new test equipment and development of new test methods Industrial Testing maintains measurement capabilities that are in stride with its clients current needs.

Do you need a measurement of headlamp beam intensity/distribution? If so Industrial will gladly perform it using its special "goniometer" positioned in a "tunnel photometer." At the same time they will be glad to measure the headlamp's "trichromatic coordinates"!

Seriously though, let's be appreciative of the contribution that Industrial Testing is making to the improvement of headlamp quality on our cars.

High Speed Chrome Tanning

Leather processing has been practiced as an art rather than a science for many generations. The Thorstensen Laboratory has made significant contributions to the industry by unraveling some of its mysteries. For example the application of Scanning Electron Microscopy (SEM) so as to better understand the physical structure of leather was reported by Thorstensen to the American Leather Chemists as early as 1969.

More recently the Thorstensen group has set its sights on a better understanding of the chrome tanning system. Factors such as quantity and strength of acid have been related directly to penetration rate of the pickle acid. Futhermore it has been learned that penetration of the chrome tanning material is regulated by the pH inside the hide. Such information has been gathered using Thorstensen-developed techniques for collecting "stratigraphic" data. What has been the net result? Thorstensen has shown that the pickling - tanning system can be considered a single process. By adding pickle acid and chrome tanning salt simultaneously the total process is speeded remarkably and a top quality leather is obtained. A bonus side benefit is that the waste water effluent volume is reduced!

Hauser Improves ECG Electrodes

Hauser Laboratories, Boulder, CO, has developed special materials for bonded electrodes used in ECG's. The bonded electrodes have the following advantages: intimate electrical contact, low mass, long-term durability, minimum motion artifacts, minimum baseline shift, minimum skin irritation, and no need for shaving patients.

Hauser has developed three types of bonded electrode systems: (1) ECG Spray, an aerosol variation of the NASA technique for bonded electrocardiography, (2) Lifesaver Electrodes, fully prepared electrodes and cables, ready for moistening and bonding to the skin, and (3) EEG Adhesive, a conductive paste, packaged in an eye ointment tube, for bonding fine wires to the scalp, eye, or other sensing areas.

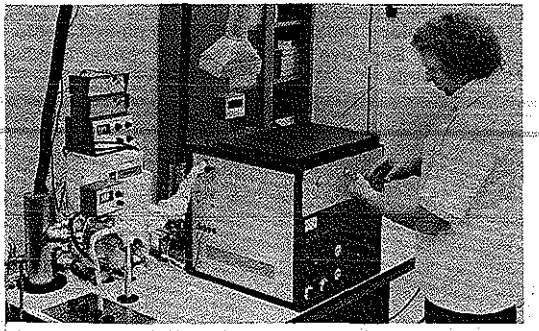
Tracings from bonded electrodes have been "either equal or superior to those obtained with other, more conventional types of electrodes used to monitor subjects."

Biological Inhalation Toxicity Study Upon Heating Of Materials

United States Testing Company, Inc., Hoboken, NJ, has performed a series of studies in order to obtain comparative toxicity data on heated materials. The technique consists of heating various construction and decorative materials in a chamber, and exposing white rats to the fumes in the chamber.

Studies have been performed on a wide variety of products, including polyvinyl chloride, styrene, urethane foam, southern white pine, red oak, and wool. The value of such a procedure is that, through this inhalation toxicity technique, useful comparative information may be obtained on structural supports, wall coverings, ceiling materials, carpeting, insulation and fabrics used in confined spaces, such as buildings, aircraft interiors, and motor vehicles. If a fire were to occur in such an area, the occupants would be exposed to the fumes produced, and their toxicity would be an important factor.

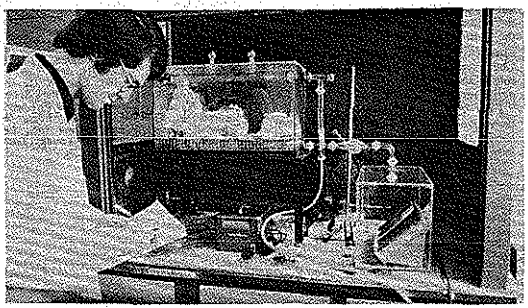
The results show that the method used is reproducible. Efforts are now being made, in cooperation with other researchers in this field, to have the results of such bioassays accepted in various codes as an indication of the comparative toxicity of materials.



WCTS scientist injects specimen into gas chromatogram coupled to mass spectrometer.

WCTS Pioneers In Instrumental Methods

Instrumental advances in recent years have added tremendous muscle to the analytical chemist for high-speed superior performance of many routine analyses. But the application of this "muscle" to the day to day special problems of American industry requires another vital ingredient — scientists with the ability to understand the practical problems of industry and to translate them into a language addressable by laboratory instruments. Such is the forte of West Coast Technical Service, Inc., Cerritos, CA. The array of instrumentation of WCTS is impressive, but even more impressive is its record of accomplishment in the solution of non-routine analytical problems — from the measurement of trace impurities in gases, the development of waste-control process plants for the chemical and paper pulp industries, to plastic samples brought back by our lunar astronauts.



Inhalation toxicity apparatus showing heating and exposure chambers.

Analytical Techniques For Wright-Patterson

Ledoux and Company of Teaneck, NJ has actively participated for many years in the development of new analytical techniques for the measurement of the less common elements in complex inorganic mixtures and has published widely in this field. It is logical that Wright-Patterson, having the need for improved methodology for the characterization of refractory mixtures would draw upon this expertise, its aerospace programs having made ever increasing demands on refractory materials for high temperature structures, coatings, insulation, etc.

The research done for Wright-Patterson is detailed in a number of unclassified reports and published in part in journals such as "Analytical Chimica Acta." The Ledoux Company's unique expertise in the area of refractory analysis is underscored by noting authorship by its Research Director, Silve Kallmann, of Chapter 10 of a recent Wiley publication "Determination of Gaseous Elements in Metals."

Did You Ever Stop To Think—

What would have been the fate of Edison's incandescent lamp project if he would have been forced to sell it to the research review committee of a big company whose major product was kerosene lamps?

"The true heroes of economic history are the scientists, the inventors, and the explorers. To them is due the actual transformation of social life." — A. P. Usher, *"A History of Mechanical Inventions,"* McGraw-Hill Company, 1929.

Dr. HESS. I cannot help but note something that Dr. Morse indicated regarding innovation coming from outside big companies.

Independent Laboratories are just such outside organizations that are often times the innovators.

I will simply mention my other qualifying experiences with the Pennsylvania technical assistance program (Penntap) and also my participation in the International Conference on Government-Industry Cooperation in Technical Innovation.

I believe that constructive action is immediately possible. The next section of my testimony is entitled "Innovation and Small Business," and I make a couple of points, one dealing with the breadth of activities involved in the innovation process, that point having already been made by Professor Morse.

I would like to stop for a moment to explain what is special about small business in the innovation process, because I think this might be valuable to you as an insight coming from a small businessman.

I say in my prepared text that, "it is very simply the creative qualities of individuals in the working environment of small business," not the bricks or mortar, or the scientific instruments, but the people. I want to emphasize that these persons are not castoffs of other employers, rather than they are an elite competent ambitious and hard-working group of scientists willing to let their productivity dictate their remuneration and professional advancement.

Many are rugged individualists who function well in a relatively unstructured environment. Is it any surprise, then, that small high technology businesses are synonymous with innovation?

In the next section I ask what has gone wrong in recent years, and we have already heard that many things have gone wrong in our country's innovation process.

During my 17 years in business, I have witnessed the direct and withering impact of Government regulations on the innovation process:

In the early years my firm participated in the development of a number of patentable inventions. In recent years, the nature of our work, reflecting the needs and wants of our clients, has changed drastically. Projects aimed at meeting environmental regulations, assessing compliance to OSHA standards, reformulating products to comply with new FDA or USDA regulations are the order of the day.

One of our more recent product developments was a controlled release form of copper sulfate designed for its safer and more efficient use in controlling aquatic pests. The active ingredient of this new product has long been recognized as appropriate for aquatic control purposes. However, we lost a year in development time in acquiring an EPA experimental permit to test the safer product in a few lakes.

In short, more and more innovative resources are directed to assisting private firms in defensive activities to comply with Federal regulations and new innovation is delayed unduly by overregulation.

We share the deep concern of many that social costs of new technology be assessed and understood, but social accountability and progress in innovating should not be mutually inconsistent goals.

Some problems are unique to small independent laboratories and related technical professional services firms, one example being the special requirements of Government procurement.

proper place, but we do object to the dilution of their important responsibilities in basic research and education by their direct competition with us in the commercial marketplace.

When we must compete with them for Government and private research funds, we insist that Federal funds be allocated without bias and that tax-favored status be adequately considered in evaluating proposals from these institutions.

The consumer movement has had a far-reaching impact on the business community and its ability to innovate. Case in point—the explosion of product and professional liability claims.

Insurance companies are rightfully alarmed by this situation and are refusing professional liability coverage to many small high-technology laboratories.

It is disturbing to have to risk the business equity resulting from a lifetime of effort with each report that emerges from my laboratory. Indeed, it severely constrains our ability to pass innovative, but risky, ideas on to our clients.

The final section in my testimony asks the question: "How can Government help?"

The first point that I make here is really important; it is to provide some kind of a valid data base on small high-technology companies.

It is surpising that data have not already been developed. Indeed, various private and Government agencies have made attempts using the questions and census approach, but their catalogings are incomplete and of little real value.

We have been very encouraged, as a result of recent conversations with NSF officials, by the interest shown in assisting in the development of a meaningful data base, such a base to include an in-depth characterization of the number, size, viability, and economic impact of independent laboratories.

Such information could be extremely valuable to the Government in fashioning Federal policies to utilize this resource in meeting national needs.

We have held conversations with the National Science Foundation and are encouraged by their expression of interest in this very area.

Another section which I will skip over is the development of incentives for the private sector, and I want to applaud the effort of Senator Nelson's committee for its past efforts in behalf of small business and to encourage further support of proposals that create proper tax and financial incentives for small business.

I have already discussed the special burdens imposed on small business by Government regulations, including the procurement of technical services.

I am not in a position to recommend a means of reorganizing the present regulatory system, but I am here to say that so long as it exists in its present form, small business, especially innovative small business, cannot play a proper role in the national economy.

I would like to emphasize the importance of the Federal Government assuming a leadership role in establishing the proper relationship among Government, academic, and private sectors in the entire process of reducing basic science to the marketplace.

on a dollar and cents basis, and there is no reason why educational institutions should be involved in such commercial activities.

Their job is education and basic research, and we respect them for that.

You might ask what unfair competition for routine testing has to do with innovation. It simply undermines our financial viability and thus severely restricts the innovative activities of our company.

Mr. Chairman, I did not get a chance to mention anything about the Pennsylvania Technical Assistance Program (Penntap). Since you asked the question regarding unfair competition, I simply wanted to mention that within Pennsylvania, the Department of Commerce as a Government agency, and the State university, by working with people like ourselves in the private sector, have found ways of putting together the resources of universities, of government, of the private sector, in a very constructive way so that we are not at cross purposes with each other.

Senator McIntyre. Thank you very much, Dr. Hess, for your valuable testimony. We may have some further questions before we close the record, which we will address to you in written form.

Dr. Hess. I will be happy to respond.

Senator McIntyre. Our next witness is Dale W. Church, Deputy Under Secretary of Defense Research and Engineering (acquisition policy); and Dr. Ruth Davis, Deputy Under Secretary of Defense Research and Engineering (research and advanced technology), the Department of Defense, the Pentagon.

STATEMENT OF DALE W. CHURCH, DEPUTY UNDER SECRETARY OF DEFENSE RESEARCH AND ENGINEERING (ACQUISITION POLICY); AND DR. RUTH DAVIS, DEPUTY UNDER SECRETARY OF DEFENSE RESEARCH AND ENGINEERING (RESEARCH AND ADVANCED TECHNOLOGY), THE DEPARTMENT OF DEFENSE, THE PENTAGON

Mr. Church. Thank you, Mr. Chairman.

Senator McIntyre. I welcome you here, today, and for your waiting for us.

Will you proceed with your testimony, bearing in mind that anything over three or four pages will be too long with the time constraints I am under. So, your statements will appear in the record in their entirety, and you can try to hit the highlights.

Representative Breckinridge. On the House side, we are voting the final passage for the Defense appropriations, Mr. Secretary, and I have an idea it is as important as what you have to say here.

Mr. Church. Thank you for your support in advance.

Representative Breckinridge. Let me say this, the Department will be before the House Small Business Committee, and I was going to reserve any questions I might have for that proceeding, so I am sorry I will not hear you today, so I can get ready for you there.

Mr. Church. See you then.

Senator McIntyre. All right.

Mr. Church. I much prefer to paraphrase with a few remarks from the statement, and you do have the full statement for the record.

As a part of this process, we hope to be able to award contracts to small businesses that we can get down to one page, in a very simplified form, and readable so they do not have to hire expensive attorneys to be able to interpret for them. This will be an evolution that will occur as a result of our new acquisition regulation and specifications and standards.

I would like to highlight a few examples of other things we have been doing around the country to get the word out to the small firms because they do not have the Washington staffs and offices so they can easily go around to the various offices and find out what is going on to get the word in advance of others.

They do not have the travel funds, they do not have the staffs, so they have to depend on us to help bridge that gap for them, and we are doing that in every area we can.

We just finished holding four nationwide regional conferences, at which we had almost 1,700 acquisition people in attendance where we talked about how to get the word out, and the importance of small business to the DOD. We received a very good response, and I think we will develop a number of new initiatives as a result of these conference-workshops.

In addition, we are supporting the efforts of the Small Business Administration and others such as the National Science Foundation to give full support to small R. & D. firms.

We have identified some 600 people in our various procurement offices as small business specialists. Their primary responsibility is devoted to aiding small business firms. Here again, we are to bridge the gap by these specialists reviewing every procurement over $2,500 to determine whether there can be a set-aside for exclusive small business participation.

We think our record can be improved, and we are working hard to do so.

In addition, in all our laboratories, we have assigned specific technical individuals to assist the small R. & D. businessman because in many cases the problem is more technical in nature rather than administrative. This forms the bridge in the communications gap in assuring a continuing dialog with the small business innovator.

There are some areas where I believe a much more serious problem exists. I would like to comment for a minute on where I think the real hard problem lies, that being the total dollars which are spent for R. & D. The expenditures have fallen dramatically over the years, not just in what we support directly through contracts, but in what companies themselves are supporting.

These dollars not only go into large firms, but they also create opportunities for people who are working there to work in projects in areas they have special interests that although not consistent with the primary interest of that particular firm, may provide for the development of new ideas, processes, or products. Many times these individuals spin off for themselves by forming their own companies and providing us with innovations.

Obviously if R. & D. dollars are going down, so are the number of opportunities that are created. This is particularly true when R. & D. dollars go down. As the allocation of such funds become more con-

providing a more complete picture of showing how small business fares in the various aspects of the R. & D. process.

Senator McIntyre. I understand now. The $389 million R.D.T. & E. contracts are awarded to small business.

What is your definition of small business?

Mr. Church. Small business varies, depending on the industry.

Typically, it is 500 employees, but there are exemptions, in some instances 750 to 1,000; so it depends on the particular industry.

These are criteria that the SBA sets up. These have a whole list of categories of businesses of which the qualifications are specified, and those criteria do determine whether or not it is so classified.

Senator McIntyre. That is one of the confusing things about small business.

When I came down here in 1962 from Laconia, N.H., I thought small business was a department store with 18 employees.

The first day of the hearing, I understood that American Motors qualified as a small business for SBA procurement purposes.

Mr. Church. Furthermore, you can be both a small business and a large business at the same time if you are working in more than one category. If the size standard for one category is 500 employees and if you exceed that, you can still be a small business where you are under 1,000 employees in another category. In one area you have exceeded the size standard by being over 500, while in the other area you are still under 1,000 employees, you are both small and large at the same time. So I agree with you. I think it is a bit difficult to understand, but as you can see, the numbers are rather constant year in and year out. It is presently 5.5 percent. As our dollars have gone up, we have held in there at the same rate.

Senator McIntyre. The question for you, Mr. Secretary, the Defense Department R. & D. contracts to small business have declined since 1974, according to the chart.

Do you know what happened in 1974 to raise the percentage one further point, and what accounts for the decline since then?

Mr. Church. It went up to 5.8 in 1974. I believe that is just the usual kind of difference from year to year.

Sometimes the amount of dollars flowing through our system tend to be more oriented toward major projects, like big new missile systems and the like, and so the percentage in a year like that would tend to go down because those dollars do not flow to small businesses.

If we had a year where the dollars tend to be more spread, and not so concentrated in major systems, then you would not have that kind of fluctuation where you would tend to go down. Rather, it would tend to go up again.

Senator McIntyre. Can I assume that in 1977, that 94.5 percent of the R.T.D. & E. contracts went to what we would consider big business, or the larger of our corporations?

Mr. Church. As prime awards, we would say that 94.5 percent went to big business.

Now, that is prime contract awards. It may be a little bit misleading because those prime contractors then in turn make many, many awards to small business on a subcontract basis.

Senator McIntyre. But not in the R.T. & D. line?

That is done typically by the SBA, however, the kind of products and the kinds of services that we are looking for in the DOD are those which are the best technology, and to the degree of small business firms can provide them, we go out and seek them. Many times we get involved with firms that are no more than what we call garage shop operations simply because they are the best, and we do give them a lot of support to bring their products along. By doing things like walking through invoices, so that they can receive payment within 1 or 2 days.

There are lots of efforts unreported on behalf of many of our procurement people to assist those people, because I think it is fairly well known that we get a lot of help for small businesses.

Senator McIntyre. This second schedule of yours, small business awards, can I infer from that, that in 1977—excuse me. Let us go back to 1975, a full year, can I assume that SBA awards of 316 were to 316 companies?

Mr. Church. I do not have any records on that, but I do not think that would necessarily be a correct inference.

Senator McIntyre. Is it true that out of that 316, that 90 percent of them are repeaters, companies that have established their reputation with you, and when you can, you try to give them a break?

Mr. Church. I frankly do not know. I will see if we have some statistics to provide that for the record.

Senator McIntyre. I do not want you to do too much work over there, you have enough to do now. But, as a matter of interest for the record, to run down, where you said 396 awards went to a certain number of company, that would be of interest to us.[1]

I would think it would be very difficult for a small company to break in, to get its nose under the tent. However, can you tell us how many men do you have in your Department to help small business obtain R. & D. contracts—how many secretaries, typists, field men, how big is your section?

Mr. Church. You mean my particular area of acquisition policy? I think my current staff is right at 50 people.

Senator McIntyre. About 50 people?

Mr. Church. Total.

Senator McIntyre. That is your acquisition staff that is men and women operating under you in this job of small business?

Mr. Church. The small business area, we have at the present time three people.

Senator McIntyre. Three people?

Mr. Church. Three people that report directly to me, those in the Pentagon.

In the military departments and the Defense Logistics Agency we have approximately 600 small business specialists.

Senator McIntyre. That are concerned every day when they come to work to try to help small business?

Mr. Church. Exactly.

Senator McIntyre. That is two for every award?

Mr. Church. This is just R. & D. dollars awarded to small business we are talking about. We are not talking about the total DOD small

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

much money as we can into the small business sector in research and development?

Mr. CHURCH. Each of the services now have an acquistion executive, and I will submit those for the record.

[The names follow:]

U.S. Army—Mr. Percy A. Pierre, Assistant Secretary of the Army (research, development, and acquisition).

U.S. Navy—Mr. Edward Hidalgo, Assistant Secretary of the Navy (manpower, reserve affairs, and logistics).

U.S. Air Force—Mr. John J. Martin, Assistant Secretary of the Air Force (research, development, and logistics).

Defense Logistics Agency—Mr. Porter T. Walton, Executive Director, Procurement, Defense Logistics Agency.

Senator MCINTYRE. Is that their sole job to help the small business in the R. & D. world?

Mr. CHURCH. They have a multiplicity of jobs, but they are the ones responsible in those services for seeing that the small business program is properly supported.

Each of them have people within their staffs, as does the Defense Logistics Agency which is responsible for small business.

Senator MCINTYRE. Do they seem to break out about evenly within that 5.5 percent? Do each come up with about 1.8 percent? Do they seem to break out evenly?

Mr. CHURCH. No; the ratio of small business R. & D. awards is different for each service. In the Army, it is 4.7 percent; in the Navy, it is 6.9 percent; and the Air Force, 3.5 percent; and then another category, other defense agencies, it is 24.3 percent. These percentages apply to new R. & D. small business awards for fiscal year 1977.

Senator MCINTYRE. You ought to kick them for that.

So the Defense Supply lists zero; what is the Defense Supply Agency and why would it be getting zero?

Mr. CHURCH. The Defense Supply Agency does not have a R. & D. mission responsibility and, therefore, would not typically be involved at all.

Senator MCINTYRE. Then I withdraw that. Well, OK. Let me ask you this: Let us suppose I am a representative of, say, a small business association, and I am concerned about the fact that the membership in the association is not doing very well; we are not getting many of these R. & D. contracts. Who do I call up for an appointment to talk about this problem?

I am John B. Smith of the executive office of the association of 250 small businesses that would like to get some of the action, and we are not satisfied we are not getting a big enough chunk, where do I go in the Pentagon to get action? Where do I get some answers?

Mr. CHURCH. If you are talking specifically, if you want real dollars, the person who really decides that, is the individual in the project office, or in some particular functional area within the services who is responsible for determining how much money will be spend and with whom. If you are talking in the generic sense, I have met with and will continue to meet with many such representatives who desire to meet with me. I have had numerous meetings to date, and we have discussed our mutual problems. From such meetings we get a lot of good input and they receive good input from us. Present at such meetings

Not for publication until released by the Select Committee on Small Business, 95th Congress, UNITED STATES SENATE

STATEMENT OF

MR. DALE W. CHURCH

DEPUTY UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING (ACQUISITION POLICY)

BEFORE THE

SELECT COMMITTEE ON SMALL BUSINESS
UNITED STATES SENATE
95th CONGRESS

August 9, 1978

Let me turn now to current activity in the DoD related to increasing small business R&D contracting. One of the items mentioned in your letter of notification of this hearing was the Office of Federal Procurement Policy (OFPP) Memorandum of 10 March 1977. That memorandum resulted from an ad hoc panel established by OFPP on which DoD was an active participant. This panel outlined actions which would enhance the role of small business in R&D and increase the share of awards made to small R&D firms. In this regard, I would like to describe several actions we have taken and procedures we follow which I believe are most supportive of the recommendations of that panel.

We believe that one of the first places to start is to get the "word" out to the small R&D businessman as to how to do business with us, which of our activities purchase R&D, and whom small businesses can contact for assistance. The key to increasing awards to small R&D firms is the number of small firms bidding on our R&D contracts. To this end, we supported the National Science Foundation's Midwest Small Business Conference on Federal Research and Development held in Chicago on May 22 and 23 for small R&D businessmen. Additionally, we have just concluded holding four regional DoD Small Business and Minority Business Conferences for senior Defense acquisition personnel. During each of these conferences, which incidentally included representatives of small R&D firms, a separate workshop was held on increasing the small business participation in our R&D awards.

We are also actively engaged with the Department of Commerce in supporting the Federal Procurement Conferences which are sponsored by individual members of Congress in their local districts or states. At each of these conferences, we provide a senior Small Business Advisor from one of the Military

Our Military Services conduct advanced planning briefings for industry to inform them of what we will be looking for in the near future. The Navy has established two R&D Information Center (NARDIC), one on each coast, which include Air Force representation. These offices make information regarding R&D planning and requirements available to small business. The Navy has also established a Navy/Industry Cooperative R&D Program (NICRAD) which furnishes scientific and technical information on the operational capabilities and requirements of the U.S. Navy to non-government activities on a cooperative, no-cost contract basis.

It is DoD policy to utilize the R&D Sources Sought Section of the Commerce Business Daily (CBD), whenever practical, to seek additional small business sources for R&D procurements anywhere from three to six months in advance of the actual procurement. This technique is particularly helpful to small business firms. It gives them an opportunity to respond by submitting technically qualifying information, to any synopsis in which they have an interest.

Our Small Business Specialists work closely with the SBA R&D Specialists in identifying additional small R&D firms to our contracting officers. The SBA provides us a valuable service by its yearly publication of a source list of small R&D firms. This list is distributed to all of our activities involved in R&D.

Finally, I would like to mention our policy of promoting technology transfer from the military to the civilian sector which we believe is most beneficial to small R&D firms. This policy encompasses (1) the transfer of technology developed by DoD activities for national defense purposes to the civilian sector where such technology can be profitably utilized in non-military

and highly skilled labor over relatively long periods without any return, the venture must be assured of a high return for those ventures which do succeed -- as many do not. Such financing simply does not exist in today's finance markets. The investor can get higher returns with less risk. More than one industry spokesperson has stated there will be no real "breakthrough" innovations in their industry until this financial situation changes dramatically. The best we can hope for is an evolution of the technology. These spokespersons are from big businesses.

Thus, our promoting and aiding small R&D firms may be greatly thwarted if the new firms are not being created. However, we shall stand continuously ready to support innovative ideas whenever and wherever they are identified. No one more than we recognize our very survival depends on our technological advantage.

RDTE CONTRACT AWARDS TO SMALL BUSINESS

(MILLIONS)

FY	TOTAL	(%)	RES	(%)	DEV	(%)	MGMT & SPT	(%)
70	$189.1	(4.0)	$31.0	(33.3)	$139.8	(3.2)	$18.3	(5.3)
71	183.3	(3.7)	28.2	(31.1)	133.6	(3.0)	21.5	(6.9)
72	255.6	(4.9)	34.6	(33.7)	193.8	(4.0)	27.2	(11.0)
73	272.1	(4.8)	42.7	(29.4)	201.0	(3.8)	28.4	(11.1)
74	300.4	(5.8)	40.7	(26.1)	223.9	(4.7)	35.8	(13.0)
75	316.4	(5.6)	38.8	(29.8)	243.3	(4.7)	34.3	(11.3)
76	311.4	(5.2)	35.7	(24.6)	231.9	(4.2)	43.8	(10.7)
76 + 7T	396.2	(5.3)	46.6	(24.7)	291.0	(4.3)	58.6	(11.2)
77	389.1	(5.5)	45.2	(25.3)	295.9	(4.5)	48.0	(11.1)

ENCL. 2

SMALL BUSINESS AND INNOVATION

THURSDAY, AUGUST 10, 1978

SELECT COMMITTEE ON SMALL BUSINESS, U.S. SENATE, AND THE SUBCOMMITTEES ON ANTITRUST, CONSUMERS AND EMPLOYMENT AND ON ENERGY, ENVIRONMENT, SAFETY AND RESEARCH, COMMITTEE ON SMALL BUSINESS, U.S. HOUSE OF REPRESENTATIVES,

Washington, D.C.

The committees met, pursuant to recess, at 9:30 a.m., in room 2359, Rayburn House Office Building, Hon. John Breckinridge, chairman of the Subcommittee on Antitrust, Consumers and Employment, and Hon. Alvin Baldus, chairman of the Subcommittee on Energy, Environment, Safety and Research, presiding.

Present: Representatives Breckinridge, Baldus, Bedell, and Patten.

Also present: Jere W. Glover, counsel, Subcommittee on Antitrust, Consumers and Employment, House Small Business Committee; Alan Zepp, counsel, Subcommittee on Energy, Environment, Safety and Research of the House Small Business Committee; and Herbert L. Spira, chief counsel, Senate Small Business Committee.

STATEMENT OF HON. JOHN B. BRECKINRIDGE, A U.S. REPRESENTATIVE FROM THE STATE OF KENTUCKY

Representative BRECKINRIDGE. The committees will come to order.

Permit me, if I might, for just a moment, to indulge in a personal aside. It is a small world in the restricting time frame that we live in. I was in Geneva not long ago and one of the colleagues with whom I was traveling with to listen in to the SALT II talks, and the comprehensive test ban treaty maneuvers, was Representative Corman from California who is a pilot and follows all things having to do with aviation.

When we got back we split at one point. He went west and I went east or vice versa. I have forgotten which. When we got back, he said: "What connection are you, if any, to Henry Breckinridge? He used to be Lindbergh's attorney."

I said: "I am his nephew." He said: "Well, it intrigues me. Out of the flight from Geneva I reached in the cover up front and pulled out a flight magazine. There was a picture of Ada Breckinridge, the wife of Henry, flying in a balloon over Paris, France, in 1903, 6 months before the Wright Brothers took off."

What reminds me of that story is the fact that Dr. Arthur S. Obermayer, who was to be with us this morning, is unfortunately unable to be here. He has submitted a magnificent statement, incorporated in which is a little story to the effect that it took the Wright Brother 5

Testimony by

Dr. Arthur S. Obermayer, President
Moleculon Research Corporation
Cambridge, Mass. 02142

Joint Hearings of the
House and Senate Small Business Committee

on

The Role of Small Business
in Science & Technology
August 9-10, 1978

The U.S. government has just begun a 14-month study of industrial innovation involving 28 government agencies. The objective of this effort is sound, and positive and effective Federal action is urgently needed. However, the time for erudite studies is past, and the time for implementation is upon us. Over a decade ago the U.S. Commerce Department assembled a panel of experts and conducted an investigation of "Technological Innovation: Its Environment and Management" (excerpts are included as an Addendum to this testimony). The report of this panel headed by Robert Charpie made seventeen specific recommendations. It recognized a serious problem looming in our economy, and it felt immediate action was needed. To date none of the seventeen recommendations have been implemented. In fact, the only action taken has been to restrict rather than liberalize stock option incentives. During the past decade we have funded many additional studies, conferences, panels and surveys, and

today's individual inventors experience are not different from those the Wright brothers encountered. With 75 years of history behind us it's easy to glamorize their experience and downplay the bureaucratic bungling they faced; so let's here set the record straight[1,2]. The Wright brothers' first sustained airplane flights were at Kitty Hawk on December 17, 1903, and two weeks later Senator Henry Cabot Lodge was made aware of the importance of these flights. He alerted the War Department. They paid no attention. By late 1904 the Wright brothers had been approached by interests in France, England, and Germany, because of the military potential of their discovery. However, they were anxious to see their inventions used first by their own country, so, in 1905 they approached the Secretary of War through their Congressman, Rep. Nevins. They offered to build a plane for the government. The government responded that such a device must be proven to work before the government would invest in research and development. Of course, the Wright brothers never actually requested R&D support; all they wanted was a contract to build a plane. After receiving that rebuff, they further improved their product and then wrote directly to the Secretary of War, again indicating that they could prove that they had built and were capable of building a practical airplane and asking what specifications would be acceptable to the government. The

contract. It had to go out on competitive bid. To everyone's surprise, there were 41 bids, two of which were lower than the Wright brothers bid of $25,000. It took Teddy Roosevelt's decision to fund all three of the lowest bidders from his discretionary funds in order to formalize the first U.S. commitment to the Wright brothers. The lowest bidder ($1800) dropped out quickly when he saw the complexity of the problem. The next lowest bidder subsequently asked the Wright brothers to build a plane for him for less than his $20,000 bid.

Thus even then it took perseverence, personal capital, good luck, and an outstanding invention, and 5 years for the "little guy" to convince the U.S. government to take a look. One can only guess how many great inventions never make it.

Unfortunately, the Wright brothers' experience is typical. The story of Chester Carlson's attempt to interest companies in xerography covers more than a decade of frustration and turn-downs. Until we learn how to recognize and promote the innovative technology of the inventor/entrepreneur, we will continue to miss opportunities. Many studies[3] have shown the high percentage of innovations that have come from individuals and small companies, even though the bulk of R&D funding goes to large institutions.

critically important economic segment and that our highly institutional society is making it increasingly difficult for that segment to survive.

NEW OPPORTUNITIES

My object here is not only to review what has not been done, but also to describe what can be done with a specific enough example so that immediate action can be taken by each Congressman. In particular, the most exciting new program to emerge from the government in years is the Small Business Innovation Program at the National Science Foundation (NSF). Under this program, small businesses were invited to submit proposals on innovative concepts that could eventually be commercialized. The NSF restricted the solicitation to six areas that related to national needs. To save time, the proposals themselves were limited to 20 pages and an abbreviated peer-review system was used. From the proposals received, 42 fixed-price contracts of approximately $25,000 each were awarded for Phase I work, whose objectives were:

- to demonstrate technical feasibility of the concept
- to prepare a report leading to a proposal for Phase II funding
- to find a source of venture capital for further work.

is sound, it will not be tried again. In future years the government will remember only that it did not succeed, but they won't remember why.

A major concern with the program has been the attitude of NSF toward small business involvement. Their normal client is the university. There are many individuals within NSF and other parts of the government who feel that the Foundation should only be supporting basic research at universities and should not be dealing with small business. In many subtle ways they have been trying to keep small businesses away from their funds. For this reason alone one might question whether NSF is the ideal place for this program. But currently it is the only agency that has the experience in dealing routinely with small-scale research and unsolicited proposals. We hope that NSF will take a less parochial view of its societal role and actively support this program which could have such a tremendous impact in our nation.

Because the program is new, funded at a low level, and not even a line item in the NSF budget, it has had low visibility in the Congress. As a tender shoot needs protection, so this program needs protection to prevent it from being destroyed. The House has severely cut the NSF Applied Science and Research Applications budget and this in turn could spell the death knell for the Small Business Innovation

REFERENCES

(1) The Wright Brothers: A Biography Authorized by Orville Wright, Fred C. Kelly, Harcourt, Brace & Co., New York, 1943.

(2) Miracle at Kitty Hawk: The Letters of Wilbur and Orville Wright, Edited Fred C. Kelly, Ed., Farrar, Straus & Young, New York, 1951.

(3) Technological Innovation: Its Environment and Management, Department of Commerce, 1967, Report of the Panel on Invention and Innovation (The Charpie Report). (Attached)

A-3

Chart 13

SOME IMPORTANT INVENTIVE CONTRIBUTIONS
OF INDEPENDENT INVENTORS
AND SMALL ORGANIZATIONS IN THE TWENTIETH CENTURY

Xerography	Chester Carlson
DDT	J. R. Geigy & Co.
Insulin	Frederick Banting
Vacuum Tube	Lee de Forest
Rockets	Robert Goddard
Streptomycin	Selman Waksman
Penicillin	Alexander Fleming
Titanium	W. J. Kroll
Shell Molding	Johannes Croning
Cyclotron	Ernest O. Lawrence
Cotton Picker	John and Mack Rust
Shrink-proof Knitted Wear	Richard Walton
Dacron Polyester Fiber "Terylene"	J. R. Whinfield J. T. Dickson
Catalytic Cracking of Petroleum	Eugene Houdry
Zipper	Whitcomb Judson Gideon Sundback
Automatic Transmissions	H. F. Hobbs
Gyrocompass	A. Kaempfe E. A. Sperry S. G. Brown
Jet Engine	Frank Whittle Hans Von Ohain
Frequency Modulation Radio	Edwin Armstrong
Self-Winding Wristwatch	John Harwood
Continuous Hot-Strip Rolling of Steel	John B. Tytus
Helicopter	Juan de La Cierva Heinrich Focke Igor Sikorsky
Mercury Dry Cell	Samuel Ruben
Power Steering	Francis Davis
Kodachrome	L. Mannes L. Godowsky, Jr.
Air Conditioning	Willis Carrier
Polaroid Camera	Edwin Land
Heterodyne Radio	Reginald Fessenden
Ball-Point Pen	Ladislao and Georg Biro
Cellophane	Jacques Brandenberger
Tungsten Carbide	Karl Schroeter
Bakelite	Leo Baekeland
Oxygen Steelmaking Process	C. V. Schwarz J. Miles R. Durrer

One, the National Institute of Education supports educational research, development, and innovation, efforts to reform the educational process and efforts to strengthen and improve educational practice in both formal and informal learning situations.

Two, the National Institutes of Health conducts biomedical research in its own laboratories and administers grants and contracts to support such research—grant awards are made to nonprofit organizations only.

Principal categories of research emphasis include cancer, heart, and lung diseases, child health, human development, aging, population problems, dental diseases, eye disorders, environmental health, neurological diseases, including stroke and general medical sciences, genetic and molecular diseases, pharmacology and toxicology.

NIH awards more contracts for R. & D. than any other component in the Department.

Three, the Food and Drug Administration insures the purity and safety of foods, drugs, cosmetics, and therapeutic devices; and correct labeling through a nationwide system of Federal inspection and surveillance and through laboratory research and analyses in its facilities throughout the country. It also contracts for a relatively small amount of R. & D. work in these areas.

Representative BRECKINRIDGE. May I interrupt?

Maybe you could answer a question for me which I have run across in the last couple of days.

We are all familiar with horror stories. This one is an unbelievable one.

I may have dreamed it last night, but I am not sure. But somewhere in the last week I have seen a statement analyzing the effect of the regulatory process on the economy today. I think it was an FDA application.

The story went something like this. During the early days of the FDA, an application for a particular product would take a couple of pages. One has a much less substantive value today in this particular instance and resulted in 200 or 300 volumes, coming to 72 linear feet. I have forgotten how many tons.

Has that horror story come to your attention? If so, could you tell me what it relates to and where I ran into it?

Mr. LASKER. It has not come to my attention.

Representative BRECKINRIDGE. I will undertake to locate it.

Mr. LASKER. It is possible, however, that we are doing our best to stimulate small businesses in paper manufacturing. [Laughter.]

Representative BRECKINRIDGE. It was so startling I remembered it, I guess.

Please proceed.

Mr. LASKER. Four, the Health Resources Administration's responsibilities involve such diverse fields as health statistics, health services research and evaluation, emergency medical services, health manpower education, comprehensive health planning and nursing home improvement. Much of its R. & D. contracting is for improving health services delivery systems.

We have in HEW, a well-functioning apparatus for assuring that consideration is given to small businesses. First, within the Office of the Deputy Assistant Secretary for Grants and Procurement, a high level official has the responsibility of developing and managing the HEW

most heavily R. & D.-oriented organization, may be able to throw light on this question.

Mr. GRAY. Mr. Chairman, in my experience in reviewing contract files, as a member of the NIH Board of Awards, in which I have reviewed approximately half of the contract files of major procurements over the last year, I cannot recall any instances where this has been documented.

We have taken recent initiatives in this area to require such documentation. However, implementation has not yet taken place.

I would expect that it is imminent.

Certain steps have been taken to implement this, but it has not yet been fully implemented at NIH.

Representative BRECKINRIDGE. Let me ask this one additional question in this connection.

Have you set a goal for yourselves? We use the figure loosely. I understand that it has to vary by the nature of the agency.

If 26 percent of Federal procurement goes to small business, and 3.5 percent goes to research and development in small business, then have you established as a matter of policy a goal to equalize more appropriately those figures?

Mr. LASKER. Mr. Chairman, we have not as yet established a goal. I think perhaps we should do this. Of course, our goal would be to increase that 3.5 percent by some reasonable amount.

I am sure that we would be able to provide you with some figures with respect to a goal, if you would be interested.

Representative BRECKINRIDGE. I think that would be useful as an exercise, internally, as well as for the committee.

I do not want to try to force anything unrealistic or unreasonable, but it would be for the purpose of opening up the subject and seeing what the different situations are, if any, and what the expectancies might reasonably be. I think it would be useful. We will hold the record open for that purpose.

Without objection, so ordered.

I did not mean to interrupt you, but I think it would probably save you some time going this way if we do not prolong it.

Mr. LASKER. Yes.

Upon request, the SBA representative is always given the opportunity to review proposed procurements and to make recommendations about whether proposed procurements should be set aside for small business participation.

We recognize that positive and vigorous efforts are essential in order to develop small business in the research and development sector of the economy. It is not sufficient to argue that small businesses are not available in sufficient numbers. It is part of our job to assure that small businesses are given the opportunity to participate fully in the R. & D. process.

Mr. Chairman, let me assure you that we do our job. As a start, we have undertaken the following initiatives:

1. Identifying small businesses that have R. & D. capabilities by publishing sources-sought announcements in the Commerce Business Daily;

2. Advertising for R. & D. small business sources in the July and August 1978 editions of the American Associations of Small Research Companies newsletter;

I think that all these programs are going to prove productive and very interesting. I look forward to hearing from you when you have gotten your September reports together.

Is there anything that either of you other gentlemen would like to add?

Mr. GRAY. Yes, Mr. Chairman. I would like to make some comments.

In my last year or so as the NIH small business specialist, I have learned that there are several barriers in NIH which make it difficult for small businesses to obtain a fair share of the research and development work.

When I say this, I am referring to the total research and development work which is obtained, both under contracts and grants because grants are the primary instrument that the NIH uses for acquiring this research. It is $4 to $1, which is the ratio of grants to contracts when you consider the contracts that are in the area of bio-medical research alone.

We have made many advances in the area of expanding small business opportunities for research support, but as far as the basic research work itself is concerned, there is much that needs to be done.

One of these things is this. I feel that research firms should be permitted to submit applications in response to grant requests for applications and to be considered and rank along with those grant applications. And, when they are of such scientific merit that they would have been funded under a grant application, that they be funded in the form of a contract if a grant is considered not to be suitable for a profit-making concern.

Taken in total, less than three-quarters of 1 percent is the figure for small business participation in the total grant-in-contract procurement for research and development work.

Mr. LASKER. Let me elaborate on Mr. Gray's statement, Mr. Chairman. In most of the grant programs operated by HEW, there is a statutory prohibition against the award of grants to a profitmaking organization.

In other words, in most instances it is required by the statute to deal with a non-profit organization, like a State or a university or a hospital or a community-action organization or something of that type.

In the case of NIH specifically, they are primarily interested in stimulating and sponsoring research in the biomedical sciences. Dr. Frederickson, who is the Director of NIH, and the scientists on his staff are well aware of the competence that lies in the university environment and the medical school environment and the hospital environment to perform this type of research.

Generally speaking, the research grants which are awarded by NIH are awarded to organizations in this non-profit environment, primarily medical schools.

There has been an increasing tendency over the last few years for NIH to try to target some of their research to the profitmaking community. This has especially become the case at the Cancer Institute. There has been a major cancer chemotherapy program, for example. Most of that research is targeted toward the profitmaking community.

So, in summary what I am saying is this: In the case of NIH, there is perhaps less of a possibility for extensive amounts of R. & D. money to be oriented towards the small business R. & D. community because

Mr. LASKER. I think you are referring to the requirement that exists for the establishment within each community of health services planning agencies which are to pass judgment on the extent to which there will be modifications or alterations to existing hospitals or hospital facilities, like an increase in the number of hospital beds, for example.

I imagine that those organizations are the ones which would pass judgment of whether hospital A or hospital B should or should not have an additional scanner.

Representative PATTEN. Apparently it is out of your line.

May I go off the record?

Representative BRECKINRIDGE. Certainly. Off the record.

[Discussion off the record.]

Representative BRECKINRIDGE. Back on the record.

Mr. Gray, do you want to continue?

Mr. GRAY. What I was saying, Mr. Chairman, was this. I feel there were several barriers which could be removed to small business participation. One is the opening of grants to small business firms. If they were not open to them, at least the process could be used so they could submit an application. If it were found meritorious and fundable, it would then be referred to the contract office for negotiation of the contract. If cost sharing was appropriate, that could be applied as well.

Representative BRECKINRIDGE. May I ask in that regard, under which of the seven categories that Mr. Lasker has testified to, does that particular proposition address itself?

On pages 4 and 5 of his prepared testimony he deals with the initiatives.

Mr. GRAY. This is not an initiative which has yet been taken. This is one which I personally advocate. It has not yet been taken.

Representative BRECKINRIDGE. Thank you. We are delighted to have that.

Let me ask you this.

Mr. Lasker, is there any reason why that seemingly very reasonable proposal will not be implemented?

Mr. LASKER. I cannot pass judgment at this stage as to whether it will or will not be implemented. I think the idea has merit.

I think it is something that requires study within NIH.

Representative BRECKINRIDGE. Could I go one step further and ask whether or not there is any statutory inhibition against it?

Mr. LASKER. With regard to the National Institute of Health, there is no statutory prohibition against awarding grants to profitmaking organizations.

In fact, sir, we have had some conversations with representatives of small R. & D. health-oriented companies in the Washington area as to the feasibility of opening up the grant competition to them.

When they became aware of some of the, shall we say, peculiar grant rules by which they would be required to abide by virtue of statute, they became less than interested.

For example, there has been a statutory provision in our appropriations act since 1966 that prohibits us from paying the full cost of any research project that is supported by a grant.

If we should make a grant to a profitmaking organization, then that profitmaking organization would, by statute, have to share in the cost.

Additionally, our general counsel is of the opinion that we are prohibited on grants from paying a fee or profit.

Representative BRECKINRIDGE. I want to thank you gentlemen for your patience and your testimony and your interest. I would like to say to you, Mr. Gray, that if you have anything else that you could submit in the way of documentation or ideas along the lines that we have been exploring, then the record is kept open for that purpose.

[Subsequent information was received and follows:]

MEMORANDUM

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
NATIONAL INSTITUTE OF HEALTH

TO : Director
Division of Contracts and Grants

DATE: June 28, 1978

FROM : NIH Small Business Specialist

SUBJECT: NIH Small Business Program

I would like to propose for consideration the idea that an increase in the number of small business firms engaged in biomedical research and development work would be of benefit to the National Institutes of Health and the American public. Few such firms are currently involved in the war against cancer and other high priority health related research issues. However, by nature of their independence, diversity, and competitiveness, small businesses represent an important potential yet largely undeveloped, resource which can be used to further the NIH mission. There is not currently a large number of these firms engaged in biomedical research yet NIH is far from powerless to change this situation. New vigor can be added to the NIH research programs by eliminating some of the barriers which have tended to be an inhibiting factor in the past and by taking some new initiatives to stimulate this sector of the economy. Removing these barriers and stimulating the small business R & D sector are consistent with national policy as expressed in the Small Business Act.

The Small Business Act

The Small Business Act (Public Law 85-536, as amended) expresses the policy that "assistance be given to small business concerns to enable them to undertake and to obtain the benefits of research and development in order to maintain and strengthen the competitive free enterprise system and the national economy." As the NIH Small Business Specialist I have learned that NIH's policies are, in several respects, inconsistent with the intent of the Act.

Small Business Act

> Sec. 2. (a) The essence of the American economic system of private enterprise is free competition. Only through full and free competition can free markets, free entry into business, and opportunities for the expression and growth of personal initiative and individual judgement be assured. The preservation

§1-4.901 General

The unsolicited proposal is a valuable means by which unique or innovative methods or approaches which have originated or developed outside the Government can be made available to Government agencies for use in the accomplishment of their missions. It is offered in the hope that the Government will enter into a contract with the offerer for (a) research on or development of the methods, approaches, or ideas it contains, or (b) the conduct of the activity or services or the delivery of the items it proposes...It often represents a substantial investment of time and effort by the offeror. It should present the proposed work in sufficient detail to allow a determination that Government support could be worthwhile and that the proposed work could enhance, benefit, and/or provide valuable input to an agency's research and development mission or to some other area of agency responsibility.

§1-4.902 Policy

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

§1-4.903 Agency program direction and operation.

Each agency shall adopt and publish policies and procedures which will encourage the submission of unsolicited proposals relating to the agency's mission. Such policies and procedures shall be consistent with the requirements of this Subpart 1-4.9. They shall be developed with an objective to eliminate restraints which discourage the generation and acceptance of innovative ideas through unsolicited proposals.

NIH has practically no policies or procedures regarding the submission and evaluation of unsolicited proposals and does little, if anything, to foster and encourage their submission.

Recommended Action:

1. In the interest of increasing competition and to carry out the purpose of the Small Business Act, allow profit-making concerns to submit proposals in response to grant Requests for Applications (RFA). These proposals would be ranked along with those submitted by non-profit organizations and awarded research contracts if, had they not been for profit, they would have been awarded a grant.

Why contract not why grant.

2. Develop and implement a strong program to foster and encourage the submission of unsolicited proposals. Develop viable internal mechanisms to receive, evaluate and negotiate unsolicited contract proposals. Unsolicited proposals are utilized extensively by the Department of Energy and the National Science Foundation to carry out their research and development missions.

3. Annually conduct a small business fair at NIH where small business R & D firms and NIH program personnel can discuss broad NIH program needs and priorities, and where firms have the opportunity to make their capabilities known to program personnel.

4. Increase training of contract and program personnel in the area of small business. Issue a statement of support from the Director, NIH, including a press release to put the small business concerns on notice regarding NIH's interest.

5. Reconsider the DHEW/NIH policy which disallows independent R & D as a reimbursable cost under NIH contracts, particularly when the R & D is related to fulfillment of the NIH mission.

6. Reconsider the DHEW/NIH policy by which small business firms are denied eligibility for letter of credit as a means of contract financing.

7. Increase efforts to identify small R & D firms with biomedical capabilities and set-aside suitable R & D work for restricted small business competition.

8. Adopt a uniform NIH wide procedure for set-aside determinations by the NIH Contracting Officers and documentation by the Contracting Officers of their rationale for negative set-aside determination. This recommendation has been approved and will be implemented in August 1978.

Potential Benefits

First, NIH will facilitate expansion and diversification of the competitive base from which innovative research ideas can arise. Secondly, NIH will achieve compliance with the public will as set forth in the Small Business Act to increase the participation of small business firms in research and development work.

HEW/NIH policy which has actually erected barriers to the federal acquisition of research from profit-making concerns. I think the independence of the profit making concerns would have a favorable impact on biomedical research, once given the chance to participate.

HEW/NIH Barriers to Participation of Profit Makers

1. The grant mechanism is the preferred instrument for acquiring research, and yet profit-making concerns are ineligible for grants. To correct this the proposals of profit makers could be ranked along with those submitted by non-profit organizations and awarded contracts, if contracts are preferred for profitmakers. Cost-sharing could be required to the extent commerical benefits are expected to result.

2. It is DHEW/NIH (not Government wide) policy to disallow for reimbursement, under contracts, the cost of independent research and development work. This policy could be loosened to expand the research base by funding relevant independent R&D. Advance approval may be appropriate. (Advance approval would be similar in effect to the award of a grant.)

3. NIH has failed to adopt a strong program to promote the submission of unsolicited proposals and to receive, evaluate, and make awards based on them. This is in spite of federal procurement regulations which require federal agencies to adopt and publish policies and procedures which foster and encourage the submission of unsolicited proposals and to establish uniform procedures that provide for the coordinated control of their receipt, evaluation, and disposition. Policies and procedures without an adequate funding source would be inadequate. To maintain a viable unsolicited proposal program either a separate appropriation for unsolicited proposals should be obtained or access to grant money should be authorized for this purpose. The present unsolicited proposal program relies upon the few untargetted contract dollars, which are entirely inadequate to sustain even a meager unsolicited proposal program.

Recommended Action

1. Either make business concerns eligible for grants, or award contracts to business concerns receiving a fundable priority score under a grants RFA, or separate contracts RFP (for broad biomedical research categories). Require cost sharing where appropriate.

2. Allow a portion of relevant independent research and development costs, as other federal agencies do.

Minority Business

The involvement of minority businesses is addressed in the opening sentence of Executive Order 11625:

"The opportunity for full participation in our free enterprise system by socially and economically disadvantaged persons is essential if we are to obtain social and economic justice for such persons and improve the functioning of our national economy."

Although NIH has increased the number of awards of support contracts to small and minority businesses, NIH awards of research and development contracts to minority businesses are virtually zero. Again, it will take positive efforts to develop this sector of the economy. It is not sufficient to argue that these firms are not available in sufficient numbers. It is part of our job to help develop this sector to the point of full participation.

With respect to small and minority businesses the following additional actions are recommended.

1. Conduct an annual small and minority business research fair

2. Increase set asides

3. Provide letter of credit financing or other form of advance payments where necessary.

4. Increase awards (particularly research contracts) to socially and economically disadvantaged firms under Section 8(a) of the Small Business Act.

Conclusion

With these actions, which are in the nature of the removal of negative discriminators against profit-making concerns, NIH can broaden and diversify the base from which research ideas can generate. Without Government support, and given the low likelihood of success on any given research project, biomedical R&D is beyond the means of most, particularly the small research firms.

It is unfair to exclude profit-making concerns, particularly small and minority businesses, from federally funded biomedical research by failing to remove present barriers and failing to develop a viable contract or grant mechanism for them.

Expansion of the involvement of profit makers so that all sectors of the economy are full participants in the accomplishment of the NIH mission must be planned so that the present shortage of profit-making

concerns in biomedical research is not perpetuated into the future, and the potential for success in biomedical research thereby limited.

Joseph L. Gray

3. Adopt a strong and adequately funded unsolicited research proposals program.

Small Business

With respect to the participation of small research firms (a small research firm is defined by current procurement regulations to be one employing less than 500 persons), the Small Business Act P.L. 85-536, as amended, states the following:

SMALL BUSINESS ACT

Sec. 2. (a) The essence of the American economic system of private enterprise is free competition. Only through full and free competition can free markets, free entry into business, and opportunities for the expression and growth of personal initiative and individual judgement be assured. The preservation and expansion of such competition is basic not only to the economic well-being but to the security of this Nation. Such security and well-being cannot be realized unless the actual and potential capacity of small business is encouraged and developed. It is the declared policy of the Congress that the Government should aid, counsel, assist, and protect, insofar as is possible, the interests of small business concerns in order to preserve free competitive enterprise, to insure that a fair proportion of the total purchases and contracts or subcontracts for property and services for the Government (including but not limited to contracts or subcontracts for maintenance, repair and construction) be placed with small-business enterprises, to insure that a fair proportion of the total sales of Government property be made to such enterprises, and to maintain and strengthen the overall economy of the Nation.

Sec. 9 (a) Research and development are major factors in the growth and progress of industry and the national economy. The expense of carrying on research and development programs is beyond the means of many small-business concerns, and such concerns are handicapped in obtaining the benefits of research and development programs conducted at Government expense. These small-business concerns are thereby at a competitive disadvantage. This weakens the competitive free enterprise system and prevents the orderly development of the national economy. It is the policy of the Congress that assistance be given to small-business concerns to enable them to undertake and to obtain the benefits of research and development in order to maintain and strengthen the competitive free enterprise system and the national economy.

MEMORANDUM

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
NATIONAL INSTITUTE OF HEALTH

TO : Director
National Institutes of Health

DATE: August 2, 1978

FROM : Contract Specialist, Contract Policy and Evaluation Branch
Division of Contracts and Grants, OA, NIH

SUBJECT: Principles of Multi-Year Health Research Strategy

The following thoughts concerning health research planning principles are submitted for consideration during the forthcoming National Conference to the held October 3-4 at the National Institutes of Health.

My experience as a Contracting Officer at the National Institutes of Health and member of the NIH Board of Contract Awards, as well as my position as the NIH Small Business Specialist and Minority Business Coordinator has given me a unique perspective from which to comment.

Principles

An increase in the number, diversity and independence of researchers would probably have a positive effect on the likelihood of research success.

Biomedical research is currently dominated by a partnership between the Government and the educational and nonprofit institutions. Even though these institutions do contain a broad and diverse membership, domination by one group, even one as large as this, many tend to unduly restrict research, actually inhibiting the diversity and independence of the researchers.

To overcome this inhibition, it is suggested that as part of planning health research, we look closely at the economic base from which research arises to see how the number, diversity, and independence of researchers can be increased.

I suggest that by merely removing the present barriers to the participation of profit making (tax-paying) concerns, the number, diversity, and independence of researchers can be increased and the likelihood of research success enhanced. Out of a total of $1.8 billion awarded by NIH under grants and contracts for biomedical research in FY 1977, some $80 million, less than 5%, went to profit makers, (small business received 1%, large business 4%, minority business virtually 0%). It is not enough to say that there is not a strong base of profit making concerns engaged in biomedical research from which to draw. It is

3. Under NIH contract provisions independent research and development work is not allowable as a reimbursable cost. This is HEW/NIH, not Government wide, policy.

4. To my knowledge no NIH contract for research and development work has ever been set-aside for restricted small business competition.

5. Profit making concerns, including small businesses, are precluded from receiving advance payments under NIH letters of credit. This favorable form of contract financing is restricted to non-profit organizations and institutions. This is in spite of federal procurement regulations which read in part "Immediate and continuing measures will be taken to facilitate and accelerate necessary contract financing assistance to small business concerns." (FPR 1-30.204) "Prudent contract financing supports procurement and production and fosters the small business policy by providing necessary funds to contractors for contract performance." (FPR 1-30.205)

and expansion of such competition is basic not only to the economic well-being but to the security of this Nation. Such security and well-being cannot be realized unless the actual and potential capacity of small business is encouraged and developed. It is the declared policy of the Congress that the Government should aid, counsel, assist, and protect, insofar as is possible, the interests of small-business concerns in order to preserve free competitive enterprise, to insure that a fair proportion of the total purchases and contracts or subcontracts for property and services for the Government (including but not limited to contracts or subcontracts for maintenance, repair and construction) be placed with small-business enterprises, to insure that a fair proportion of the total sales of Government property be made to such enterprises, and to maintain and strengthen the overall economy of the Nation.

Sec. 9 (a) Research and development are major factors in the growth and progress of industry and the national economy. The expense of carrying on research and development programs is beyond the means of many small-business concerns, and such concerns are handicapped in obtaining the benefits of research and development programs conducted at Government expense. These small-business concerns are thereby at a competitve disadvantage. This weakens the competitive free enterprise system and prevents the orderly development of the national economy. It is the policy of the Congress that assistance be given to small-business concerns to enable them to undertake and to obtain the benefits of research and development in order to maintain and strengthen the competitive free enterprise system and the national economy.

NIH Policies and Procedures

1. Instead of strengthening the competitive base of R & D firms from which new biomedical advances may be made, NIH has eliminated small businesses from the bulk of the research opportunities by refusing to consider them under the predominant NIH research award instrument, the NIH grant.

2. Another alternative whereby NIH can avail itself of innovative research ideas which might be generated by small business firms is the unsolicited proposal.

   The federal procurement regulations in regard to unsolicited proposals are quoted, in part, below:

5621 Southwick Street
Bethesda, Maryland
August 15, 1978

Chairman
John B. Breckinridge

Subcommittee on Antitrust, Consumers, and Employment
House Small Business Committee
2361 Rayburn House Office Building
Washington, D.C. 20515

Mr. Chairman:

On August 10 I accompanied Mathias Lasker, Acting Deputy Assistant Secretary for Grants and Procurement, Office of the Secretary, Department of Health, Education and Welfare when he testified as a witness in the Joint Hearings on Science, Technology and Small Business of the Senate Small Business Committee, the Subcommittee on Energy, Environment, Safety and Research and the Subcommittee on Antitrust, Consumers and Employment.

In amplification of my remarks before the committees and in response to your request for additional information I hereby submit copies of recent memoranda regarding inhibitors to the participation of small and other profit-making concerns in the conduct of health related research work acquired by the National Institutes of Health. I previously submitted these memoranda to the Director, Division of Contracts and Grants, NIH, and the Director, NIH respectively.

I would be happy to further assist the committees in their efforts to enable the Government to make better use of the innovative forces of small businesses in exploring technological and scientific frontiers.

Sincerely,

Joseph L. Gray

Joseph L. Gray

Consequently, the grant mechanism is one that is really quite questionable when it comes to the typical profitmaking organization. It is a less attractive mechanism.

Representative BRECKINRIDGE. May we get the opinion of counsel in that regard and with regard to any statutory limitation and inhibition as applies to the observation of Mr. Gray?

Mr. LASKER. Certainly.

Representative BRECKINRIDGE. Without objection, so ordered.

Representative PATTEN. Mr. Chairman, in case I must stay on the floor, would you put this in the record preceding my introduction of Dr. Garber who is last on the list?

Representative BRECKINRIDGE. Without objection, so ordered.

We appreciate your interest.

Representative PATTEN. I will try to get back.

Representative BRECKINRIDGE. We will take a recess at this time.

[Recess taken.]

Representative BRECKINRIDGE. The committees will come to order.

Mr. Glover?

Mr. GLOVER. During the recess I chatted with the witnesses. I would like to save some time.

One of the things that we are always concerned about when we have new small offices that are created in agencies is whether they have access to the policymakers and whether they have real input.

I was pleased to find out that is the case that they do have access and they do have input.

Another area that I would like to address is this, Mr. Chairman.

The President has stated that he desires to increase minority procurement by two or three times in the near future.

Have you developed a program, or are you developing a program to insure that this increase does not come from other small businesses?

Mr. BOYD. What we have done is that each year we require our components to submit small business goals, minority business goals, and set-aside goals and so forth. Each year we ask for increases.

This particular year we asked for a doubling of minority business goals during the next 2 fiscal years. We have placed emphasis on procurements under grants, where possible.

We have placed emphasis on subcontract awards to minority concerns as well.

So, a substantial portion of the increases that we expect in the minority business area would come from those areas.

Mr. GLOVER. That is good, because that is of concern to us that we do not end up destroying small businesses while increasing minority businesses. We need to increase both of them. There is a serious shortage.

It sounds as though you are addressing the problem very well.

I have one other statement I would like to make, Mr. Chairman. This is to save time.

Mr. Lasker stated that he was not even familiar with the NSF program until he heard the testimony today. If nothing else, these hearings may serve to allow other agencies doing research and development to understand some of the things that other agencies are doing. I think this is a good exchange. Hopefully, it will continue on in the executive branch after these hearings are completed.

That is all I have, Mr. Chairman.

the competence, for the most part, lies in medical schools and hospitals.

Representative BRECKINRIDGE. Mr. Glover?

Mr. GLOVER. If I understand what you are saying, in some instances there are specific statutory prohibitions against your using——

Mr. LASKER. In most instances.

Mr. GLOVER. I see.

In any instance where there is not such statutory prohibition, you are not urging that the award be given to other than the firm, be it university or otherwise, which can do the best job for the least amount of taxpayers' money; are you?

Mr. LASKER. Certainly not. In fact, on all our research grants, we make it a practice not to pay the full cost of the research project. We require cost sharing on every research grant.

Mr. GLOVER. If, for example, a small business can come forward with results—what we were concerned about is that we have heard of instances where agencies have granted money and awarded contracts to individuals who were with universities and nonprofit organizations who suddenly then went in to establish their own organization and then reapplied with the same type of proposal that they had been complying with consistently before receiving awards and were suddenly cut off. That has apparently happened all too frequently.

Everything was exactly the same, except the man's letterhead suddenly changed. In those kinds of situations we have something that is of concern.

Everything else is the same. The quality and even the price may be less, but we would hope that as we talk with other agencies that equality, that is, that fairness be awarded in every decision.

Mr. LASKER. Yes, sir. I could not agree more.

I am not aware, incidentally, offhand of any of the circumstances that you describe happening at NIH. It may have happened, but as I say, it has never come to my attention.

Mr. GLOVER. Thank you.

Thank you, Mr. Chairman.

Representative BRECKINRIDGE. Mr. Patten?

Representative PATTEN. You do not necessarily have to answer me, gentlemen. I have had inquiries from some of the small business people during research and development on some phases of equipment which would be pertinent to scanners. HEW has a tremendous amount of power over these.

They are raising the question that the door is locked on them under the present system.

Did you comment at all about your approval of scanners which run $500,000? There is a question of small-business people getting in. Is there any chance for them at all; do you think?

Mr. LASKER. Mr. Patten, in addition to being out of your line, it is somewhat out of my line also.

But let me say this. I am not aware of the extent to which HEW does or does not contract for the purchase of scanners. I think perhaps we may do it indirectly through the medicare and medicaid programs.

However, I am not aware of whether we do it directly.

Representative PATTEN. I know how you do it. I have two hospitals with scanners in my district. They must have HEW approvals. You give grants.

3. Mailing copies of the NIH Guide for Contracts to small business firms to make them aware of ongoing and proposed research projects and also to include them on the NIH computerized mailing list;

4. Identifying those firms with R. & D. capabilities in the Small Business Administration's directories and placing these concerns on the NIH mailing list;

5. Providing in-house counseling, assistance, and advisory services for small business firms that visit our contracting offices to inquire about opportunities where they can market their capabilities;

6. Conducting seminars and individual conferences for program and project officials within the Department to inform them of the small business program; and

7. Inviting small business concerns to the National Institute of Education several times during each year to make presentations to procurement and technical officials describing their capabilities in the educational R. & D. area.

Representative BRECKINRIDGE. Before we leave that part of your testimony, Mr. Lasker, let me try to get a handle on this. We have not quantified anything on our way through here.

This is, I take it, a part of your new initiative. Are you able to evaluate the results as yet? If not, when do you think you might be and at what point would you be, able to make available, for the record, some indication of the success with which those efforts have been met?

Mr. LASKER. I would like to defer to Mr. Boyd.

Mr. Chairman, we would expect to get some feedback on this at the end of this fiscal year.

Representative BRECKINRIDGE. October of next year?

Mr. BOYD. September 30.

Representative BRECKINRIDGE. This year?

Mr. BOYD. Yes.

Representative BRECKINRIDGE. This is great. When you have had an opportunity to compile and evaluate that, we will keep the record open, if we might, in order that we might hear from you for the purpose of not only knowing what the end result is, but what, if anything, we might do to facilitate your conduct and extension of this approach.

Mr. BOYD. We would be glad to do that.

Representative BRECKINRIDGE. Without objection, so ordered.

Please continue.

Mr. LASKER. In addition to these initiatives, the Department has been actively involved in several small business research and development conferences sponsored by the National Science Foundation with a view towards expanding R. & D. opportunities for small business concerns.

We believe that these initiatives will advance the research and development posture of small business significantly, and we intend to carry them out vigorously.

Mr. Chairman, this concludes my prepared statement. I will be pleased to answer any questions you might have.

Representative BRECKINRIDGE. Let me thank you very much, Mr. Lasker for that report.

I am delighted to get in on the beginning of that. I think it is promising. You are in an exotic field. In small business we do not generally think in terms of health-oriented scientific research and development, as such.

small business program and for advocating the use of small business concerns.

In addition to this, 16 individuals have been appointed in headquarters procurement offices and in each of the 10 regional offices of the Department to serve as small business specialists.

These individuals are responsible for reviewing proposed procurement to assure that a fair proportion of the particular program's total purchases of goods and services is placed with small business concerns.

As I mentioned earlier, Mr. Chairman, in fiscal year 1977, approximately 21 percent of our total procurement volume went to small business.

In addition, the contracting officer is required to review individual procurements to determine if they can be set aside for small business and labor surplus area concerns, and to set forth in writing the factual basis for his decision regarding the type of set-aside selected or the decision not to make a set-aside.

Furthermore, the Small Business Administration has assigned a representative to work with our procurement offices to carry out the purpose of the Small Business Act.

Representative BRECKINRIDGE. How long has that process and procedure requiring review of individual procurements been in place?

Mr. BOYD. That particular process, insofar as the contracting officer is concerned, is very recent.

Prior to that, it has been the responsibility of the small business specialist assigned to a particular contracting office, to review the procurements and make recommendations for set-asides.

But now we are requiring the contracting officers to document their justification or reasons for setting the procurement aside or not setting it aside for small businesses.

Representative BRECKINRIDGE. This is not intended as a criticism. This is a reaction.

That process could result, of course, in sort of a defensive documentation rather than an affirmative examination. Have you had enough experience yet with this new procedure to determine whether it would fall into the former category of being defensively oriented in terms of justifying a non-set-aside policy of practice in a particular case? Or is it affirmatively oriented?

Mr. BOYD. I think it is affirmatively oriented. I do not have precise figures that would indicate improvements, but based on my observation, it appears as if we are making improvements.

Representative BRECKINRIDGE. Would it be asking too much to ask you this? It depends entirely on how you computerize your setup.

Could you conduct a review for the purpose of judging and evaluating the extent to which the practice is changing the percentages? Your percentage, if I have that percentage correctly from page 1 of your testimony, reaches about the national percentage that I was talking about—$17.3 million of $477 million. And that is 3.5 percent.

That is the one we were complaining about orignially with reference to other segments of the Federal Establishment. I say complaining about it. We were really observing and noting that as we went in.

It would be assumed that this would change under your new procedure.

Mr. LASKER. I think perhaps Mr. Gray, who represents NIH, the

provision of incentives aimed at encouraging independent inventors, inventor-entrepreneurs, and small technologically based businesses. The cost of special incentives to them is likely to be low. The benefits are likely to be high.

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[4] J. Jewkes, D. Sawers, and R. Stillerman, The Sources of Invention, St. Martin's Press, 1958, particularly pp. 72-88, and Part II.

[5] D. Hamberg, "Invention in the Industrial Research Laboratory," Journal of Political Economy, April 1963, p. 96. See also, Concentration, Invention, and Innovation, U. S. Senate Antitrust Subcommittee, 89th Cong., Part III (Government Printing Office, 1965), p. 1286.

[6] M. J. Peck, "Inventions in the Post-War American Aluminum Industry," in The Rate and Direction of Inventive Activity: Economic and Social Factors, National Bureau of Economic Research, (Princeton, New Jersey, 1962), pp. 279-92. See also, U. S. Senate Antitrust Subcommittee, op. cit., p. 1296 and 1438-1457.

[7] Hamberg, op. cit., p. 98. See also U. S. Senate Antitrust Subcommittee, op. cit., p. 1287.

[8] J. L. Enos, "Invention and Innovation in the Petroleum Refining Industry," in Rate and Direction of Inventive Activity, op. cit., pp. 299-304. See also, U. S. Senate Antitrust Subcommittee, op. cit., p. 1287 and pp. 1481-1503.

- Professor John Jewkes, et al, showed that out of 61 important inventions and innovations of the 20th century, which the authors selected for analysis, over half of them stemmed from independent inventors or small firms.[4]
- Professor Daniel Hamberg of the University of Maryland studied major inventions made during the decade 1946-55 and found that over two-thirds of them resulted from the work of independent inventors and small companies.[5]
- Professor Merton Peck of Harvard studied 149 inventions in aluminum welding, fabricating techniques and aluminum finishing. Major producers accounted for only one of seven important inventions.[6]
- Professor Hamberg also studied 13 major innovations in the American steel industry -- four came from inventions in European companies, seven from independent inventors, and none from inventions by the American steel companies.[7]
- Professor John Enos of the Massachusetts Institute of Technology studied what were considered seven major inventions in the refining and cracking of petroleum -- all seven were made by independent inventors. The contributions of large companies were largely in the area of improvement inventions.[8]

Chart 13, which is based on the above studies, illustrates some of the important inventive contributions made by independent inventors and small companies in this century. One finds the range and diversity of these inventions impressive. Indeed, the mercury dry cells in our electronic watches, the air conditioners in our homes, the power steering in our automobiles, the FM circuits and vacuum tubes in our Hi-Fi and television sets, the electrostatic-copying mchines in our offices, the penicillin and streptomycin in our medicine cabinets, and the list goes on -- all of these inventions, which are generally taken for granted, take a new meaning when one identifies them with their sources. The point to be made is that independent inventors and small firms are responsible for an important part of our inventive progress, a larger percentage than their relatively small investment in R&D would suggest.

It goes without saying that the United States could not depend solely on the innovative contributions of small firms. The large firms are indispensable to technological and economic progress. From a number of different points of view, however, we are persuaded that a unique cost-benefit opportunity exists in the

Program. Fortunately there are a number of individuals who recognize the potential importance of the program, and so far it has been saved. Perhaps it would be valuable at this time not only to consider studies which may have impact many years in the future but also consider this important program which could bring immediate results.

Because of the need to attract outside capital, the small company was allowed to retain patent rights. Before the government decides on Phase II funding, it wants to see a contingent commitment from a venture capital source. If work under Phase II NSF funding demonstrates that the technology is technically and economically sound, then the venture capital source should be prepared to provide the financial resources to commercialize the innovation. This means that each participant is responsible for what he can do best. NSF provides the scientific evaluation, the small business perfects the technology, and the venture capital assesses its marketability. It is anticipated that Phase II funding will be in the $200,000 to $400,000 range, and that about one-half of the Phase I awardees will receive Phase II funding.

This program could potentially be one of the most significant government programs of this century in the field of science and technology. But it must have proper support and not fall victim to bureaucratic or political pressures. This program hopefully will be the model for small business innovation programs throughout the entire government. However, it is on shaky ground. In fact, at this very moment it is not clear whether sufficient funds will be appropriated by the Congress to continue the program. If it fails, even though the concept

CURRENT PROBLEMS

Today the inventor/entrepreneur finds financial support no easier to obtain than did the Wright brothers. Mission-oriented government agencies want to buy big hardware that only large companies can produce. But big companies retain in-house the innovative parts of the large government contracts because they want to control whatever patent opportunities are possible. The little subcontractor thus isn't left with much.

The government procurement officers suffer from the "big company syndrome." They find it safer, easier, and more comfortable to deal with large companies. They want to avoid inconvenience but above all they want to avoid vulnerability. If a small company does not perform, those responsible for its selection are criticized for dealing with "an unknown." If a big, well-known company doesn't perform, the ready excuse is, "if they can't do it, probably no one can."

There have been few attempts on the government's part to use the innovative capabilities of small research-based companies and of individual inventors. For the most part we have only heard lofty statements of principle, been to large numbers of workshops, and seem unnumerable study reports that confirm that the inventor/entrepreneur represents a

War Department responded that they did "not care to formulate any requirements for the performance of a flying machine." The military had its "catch 22's" even then! During the next year, Senator Lodge and his cousin Godfrey L. Cabot met with War Department officials and showed them bulletins from all over the world describing the Wright brothers achievements, but by this time the lack of action by our military was a source of embarrassment. The "safest" thing to do was thus to cover up and wait for the Wright brothers to take the initiative again. By 1907 President Roosevelt had been made aware of the Wright brothers' success. He demanded a more complete evaluation.

After many letters and a formal proposal to build an airplane for $100,000, the Wright brothers got a final response to the effect that there were no funds for an airplane in the current budget, and that a special appropriation by Congress would therefore be required at its next session. Finally, in 1908, they found a Product Champion, Frank Lahm, a U.S. Army Lieutenant, a balloonist, and son of a famous French aeronaut. Lahm prevailed on the Army to take positive action. The Wright brothers were asked to go to Washington and draw up specs for a $25,000 airplane, the maximum amount the Army said they could allocate. But then, true to form, the government realized that it could not award a sole source

procrastinated as the problems became more acute.

Our nation has an outstanding record both in doing basic research and in developing military hardware, but we have not been very effective at bridging the gap between the laboratory and the commercial marketplace. Governments of other countries have been much more imaginative and aggressive in promoting commercialization of technology. Our inability to develop this science/technology linkage has really hurt - it is having a major effect on the quality of our life because it represents a decline of U.S. industrial might, a loss of jobs, a precipitous devaluation of the dollar, and a decrease in our standard of living. Today, for the first time, we have broad concerns about the way foreign technology is running circles around our industries: overseas steel making use of more advanced technology, foreign auto manufacturers are the first to introduce new features, new energy technology is adapted more quickly in other parts of the world. We just haven't developed the mechanism for effectively utilizing our innovative technology. How come? Let's start by taking a look backward.

THE WRIGHT BROTHERS ET AL

The government directs huge sums of money into R&D, but little of it ever reaches the "lone" creative inventor, the kind who can make the difference. But the difficulties

years to prevail upon the Federal Government—despite the fact that the French were trying to press money on them—to develop the airplane.

So, she only beat them by 6 months, thanks to the dereliction, the delay, and the usual frustrations that are attended with doing anything with the District of Columbia's government; namely, the U.S. Government.

Today, the Subcommitee on Antitrust, Consumers and employment, Congressman Baldus' Subcommittee on Energy, Environment, Safety and Research, and the Senate Small Business Committee begin the second day of our joint hearings on the subject of science, technology, and small business.

The focus of these joint hearings is on a paradox concerning this subject.

Yesterday, when we met on the Senate side, we heard testimony from Dr. Press, President Carter's adviser on Science and Technology; Jordan Baruch, Assistant Secretary for Science and Technology, U.S. Department of Commerce; and from several other witnesses whose expertise lies in the field of small business and research and development.

We heard witnesses who stated that small business is the primary source of new ideas, new innovations, and development. We heard that small business is vital to the innovative process that lies at the heart of scientific and technological advancement, and what we have been referring to as our technological edge of superiority, which some say is fading at an alarming rate.

Yet, here is the paradox. Small business, which generates more than half of the innovative developments in this Nation at less than half the cost, receives about 3.5 percent of the Federal investment in that area.

Its share of Federal research and development funds borders on being a national disgrace.

Our purpose here today is to investigate the reasons that underlie this situation. We have studied small business contributions to the innovative process enough. Those reports are a part of the record which was developed yesterday. We now need to act.

Today we will hear from Mr. Aaron Gellman of Gellman Research Associates, Jack T. Sanderson of the National Science Foundation, Adm. Leroy Hopkins of NASA, Lester Fettig of the OMB, Matthias Lasker of the Department of Health, Education, and Welfare, Michael Tashjian of the Department of Energy, and from Dr. Charles Garber.

At this point I would like to insert in the record the statement of Dr. Arthur S. Obermayer, to whom I referred earlier.

It is a comprehensive and thoughtful study of the problem before us today. I only wish that he were here to deliver it himself and to visit with us in connection with that.

Without objection, so ordered.

[Material to be supplied follows:]

DEPARTMENT OF DEFENSE
R&D AWARDS TO ALL BUSINESS FIRMS
(MILLIONS)

FISCAL YEAR	TOTAL AWARDS	SB AWARDS	%
72	$5,168	256	4.9
73	5,656	272	4.8
74	5,148	300	5.8
75	5,601	316	5.6
76 + 7T	7,543	396	5.3
77	7,121	389	5.5
1/2 77	4,717	184	3.9
1/2 78	4,791	232	4.8

ENCL. 1

applications, and (2) the identification of coming technologies of both military and civilian interst and the exploration of the feasibility for cooperative funding and for development of such technologies. We accomplish this primarily through our Defense Documentation Center (DDC). DDC assists these Government contractors -- and potential Defense contractors -- by supplying technical reports of completed R&D efforts as well as summaries of ongoing R&D projects.

In summary, the DoD is acutely aware of the role small businesses play in innovation and deeply concerned about their health and well-being. In this latter regard there are certain factors which contribute to this process for which we have no control.

The first is the overall declining R&D dollars both with respect to those financed internally in the companies and those provided by Government contracts. For although these dollars flow to and within big companies they serve as the "seed" money for the spawning of new firms. What happens in this process is that a group of employees of the big firm discover a new approach to solving a problem while pursuing R&D projects. The big firm declines to pursue the idea for good and valid business reasons such as they have another proven approach deemed to be adequate, it is out of their "line" of business, or it is simply too risky relative to the investment required. These employees believing they recognize a new "breakthrough" then decide to join in a new venture.

These new ventures soon run headlong into the next negative factor. The first hurdle they must face is financing. Usually the type of persons willing to make the entrepreneural sacrifice are young and without sufficient resources to begin such a venture without substantial external financing. Because of the risks associated with such an undertaking involving high expenses in equipment

Services or the Defense Logistics Agency as well as other DoD representatives from our activities located in the proximity of the Congressional member's constituency. These DoD personnel provide information on how to do business with the military. Businessmen are given copies of the booklet, "Selling to the Military" which tells them what products and services each of our activities buys and what procedures must be followed to be placed on our bidders' mailing list. Of particular interest is the separate section on Research and Development listing our R&D activities, what they buy, and how to prepare an unsolicited proposal. I might also mention that we publish a booklet listing each of our approximately 600 Small Business Specialists by their assigned procurement activity and location. These individuals assist businessmen desiring to obtain procurements but more important, they screen procurements over $2,500 to determine if it can be set-aside for exclusive small business participation. Additionally, all of the Military Services distribute publications which treat their requirements in greater detail.

A specific senior technical individual at each of our laboratories has assigned as one of his duties to help small business obtain research and development contracts. Individuals so assigned work with the small business specialists in terms of offering advice on R&D matters, such as identifying the particular engineer who is most familiar with a forthcoming R&D procurement. This is part of our continuing efforts to involve technical personnel in the small business program.

We synopsize all of our procurement requirements valued in excess of $10,000 in the Commerce Business Daily (CBD). Notices are also published of every award valued in excess of $50,000 which provides small firms the opportunity to compete for subcontract awards.

Mr. Chairman and Members of the Committee:

I appreciate the opportunity to appear before your Committee today to discuss small business participation in research and development activities of the Department of Defense (DoD).

I have with me Dr. Ruth M. Davis who is the Deputy Under Secretary of Defense for Research and Engineering (Research and Advanced Technology). She is responsible for the Defense Science and Technology Program. Dr. Davis is also the Department of Defense's Representative on the Industrial Innovation Steering Committee.

We in the Department of Defense are also very concerned about getting more small firms involved in our research and development programs. Small businesses are probably cheaper and probably give us more for our money than large businesses do. But more than a dollar value, the real innovations of this world, whether it be in new weapon systems or whether it be in new service techniques, by large measure come from the small firms which support the Lockheeds, the Boeings, the McDonald Douglasses and the other giants of the industry.

While we are not satisfied with the degree of small business participation in our R&D, I would like to note that during the last six-year period the total dollar amount annually contracted to small business in R&D has increased from $256 million to $390 million, while the percentage has remained at about 5.5%. (See Enclosures 1 and 2). These dollar totals are for R&D performed by business firms only and do not include that performed by universities and non-profit institutions.

will be my staff adviser, who is full time on small business, and that person's only function would then be to determine what kind of actions we should be taking to help small R. & D. firms and then proliferate that through that person's regular meeting with the service small business advisers.

Senator McIntyre. How long have you been on this job?

Mr. Church. Now I guess about 1 year.

Senator McIntyre. One year, but you are a small businessman yourself?

Mr. Church. I have been.

Senator McIntyre. And everytime you get up in the morning, you decide to break your back for small business?

Mr. Church. Yes, sir.

Senator McIntyre. The reason I say that, I don't know, so many people have been through my office, I get a call from somebody, that says this gentleman who represents an association has been dealt very summarily over at the Pentagon by somebody. This might have been 2 years ago, it might have been 8 or 9 months ago, I do not remember, so I said I will talk to him, I am the chairman of the R. & D. Subcommittee of our Defense Committee, and I just try to sympathize with him, and I think Dr. Perry appeared before me that day, is he your boss?

Mr. Church. He sure is.

Senator McIntyre. A very fine man, I am very proud of him, and I chased Dr. Perry for a few minutes, and asked: What are you doing about the small business over there? Are you getting after that man there? And, so everybody is concerned about small business, but nobody can seem to do anything for them.

Mr. Church. Mr. Chairman, let me point out that every day we get letters from Congressmen and directly from small businesses that we follow down as far as we need to go to resolve the problem, and I do not know at this moment of any problems that have been left unresolved over any great period of time.

We do have a regular procedure and process, and much of our time is spend assisting small businessmen with any problems they may be experiencing.

Senator McIntyre. Well, I think one of the aims of this committee today is to improve those percentages in the years to come of 5.5, and I would like to see it get up to around 8 or 9 percent.

That is what we are going to be driving at, by way of this agency review that the President has set up, and through what they will be trying to achieve, and also on the congressional side. And we want all of the cooperation we can get from you.

I want to thank you for appearing here, and for your patience in waiting for us.

Thank you, Secretary Davis, very much.

We will recess the hearings until tomorrow morning at 2359 in the House Rayburn Building.

[Whereupon, the committees were recessed at 12:15 p.m.]

[The prepared statement of Mr. Church follows:]

business awards which is substantially greater than the R. & D. small business awards.

Senator McIntyre. Yes, there is better luck out in operations, overall operations and management, better chance for small business to get in there.

Of those approximately 600 spread throughout the service?

Mr. Church. That is right.

Senator McIntyre. How many of them would you consider professionals?

Mr. Church. All of them.

Senator McIntyre. There are no typists?

Mr. Church. These are specialists, these are not the typists.

These are the ones that have this responsibility as part of their job.

Senator McIntyre. You have a split between small business and the minority, is that right?

Mr. Church. Yes.

Senator McIntyre. And we find the minority has one professional and a task force of three, this is up in your shop, with a reported target of seven.

Small business has one professional and shares a secretary with the minority.

The services have refused to provide a comparable task force to small business, because they say they have done enough. Since 96 percent of Department of Defense small business contractors are nonminority, the majority, that kind of allocation raises a question in our mind as to where the emphasis is going, and where the effort is being made.

How would you respond to that?

Mr. Church. I would say the amount of energy we have seen out of our group responsible for minorities has been greater. They simply have gotten up to speed a little faster, and they got their task force together earlier.

Senator McIntyre. I see.

Mr. Church. We are trying to do the same parallel effort with respect to small business. Everybody has been given that charge to do so. We have sent a memo to the services and the Defense Logistics Agency [DLA]. We are in the midst of negotiating with them, as we did for the minorities.

This is an internal matter, and we are sort of in midair right now.

We are putting together a task force, and the services are going to support us. So we will be well prepared for the President's 1980 small business conference. It is not because of a lack of emphasis. The emphasis is at least as great on the small business program. It is just that we have not come up to speed as fast in one area as the other. We will make sure from now on more attention is placed on small business matters. As I mentioned, we are organizing the same kind of task force. We are proceeding in the same parallel fashion to try to get the pressure built up within the service organizations and DLA to emphasize small business.

Senator McIntyre. Will you give me the name of the man that you talked to in the Army, or the woman you talked to in the Army, who is in charge of this very problem, of trying to assist, trying to get as

Mr. CHURCH. Oh, yes.

Senator MCINTYRE. Is there any way we can find out what that figure is?

Mr. CHURCH. I called around for the last 2 days to try to find that figure, and I find there is no such figure available.

Senator MCINTYRE. Now you have asked another question. You have added more regulations to the problems of big business, they have now to tell you what they gave out to small business.

Under those circumstances, I do not know why anybody deals with you at all, I really do not.

We see so much unfairness. Remember Lockheed? If a firm employing 850 people came down to Washington and said we are in an awful jam, our cash flow is drying up and we need help, do you think we could get Uncle Sam to underwrite a guarantee on their bonds and their loans and their mortgages.

We would tell them: "No, look, that is the free enterprise system, go now on home." But, in the Lockheed case we guaranteed it, and thank God Lockheed came through and paid it off.

What attention has the Defense Department given to the March 10, 1977, OMB report on increased use of small technology based firms, did you ever know about it?

Mr. CHURCH. We participated in it.

Senator MCINTYRE. What have you done about it?

Mr. CHURCH. I believe you can pick out our responses point by point.

Senator MCINTYRE. Do you consider yourself a champion of small business?

Mr. CHURCH. Absolutely. I participated as part of a small business for some 9 years before I came to the Government. The year before I joined the DOD I started some six small businesses. So I have been a part of the process. I understand it, and I certainly believe in everything I say about the real innovation. The real breakthrough types of things do come from small business. However, I must also point out that the initial effort for those often comes from big business as well. That is the R.D.T. & E. seed money which started in the big business and their employees broke off to form their own small R. & D. firms.

Senator MCINTYRE. Do you have any cost overruns with the small business contracts that you award?

Mr. CHURCH. Oh, yes.

Senator MCINTYRE. Just as many as you have with big ones?

Mr. CHURCH. I do not have any statistics on that, but small businesses do overrun from time to time.

I would suggest that we typically would get more for our money from small businesses. They are more apt to donate their time when they get into trouble. They do not have the same restraints and usually small business people are highly spirited, and they take more pride in their work. So, I am sure there are lots of unreported efforts that they do which nobody ever knows about, because they do not ask us to support these additional efforts.

Senator MCINTYRE. You look them over pretty carefully as far as their competency is concerned?

Mr. CHURCH. We are not the one that typically certifies their competency in a formal sense.

centrated, those risky areas that do not have immediate payoff tend to be overlooked the most. These high risk ones are those on our leading edge of technology, where we must have the DOD strong.

As I have testified before, it is in the area of finances where small innovative firms need the most help.

There is just simply not sufficient risk capital available out there in the finance world today. Dollars are there, but they are not dollars investors are willing to put to the kind of risk associated with the real kind of innovation that we are talking about here. This kind of innovation takes a lot of very highly skilled people, working very hard for long periods, with very expensive test equipment and other kinds of capital equipment to be able to bring such ideas to fruition.

Sometimes it takes 2 or 3 years to bring a product through that process and to be able to market it successfully. It takes a lot of money, and people willing to take the risk. Not all of them succeed. Many of them fail in that process and they are very expensive losses.

Those risk-type of dollars are not now available, and have not been for some period of time. So, if in the process of our looking to solicit as many small R. & D. firms as possible new businesss are not being created that have this real entrepreneurship, and the real wherewithal to really move forward, then it will be most difficult for us to make any large increase in our percentage of awards to such firms. Obviously, there are businesses ongoing, doing a good job, and we continue to support those.

The unfortunate part is that those businesses that really do want to succeed and be dynamic, usually grow to be big. However, if we have no new feeder companies coming into the system, the number of small businesses to whom we can award tends to diminish, particularly those with leading technologies.

We have seen that process happen.

Thank you.

Senator McIntyre. Secretary Davis, do you have any statement to present?

Dr. Davis. No; I will just be available for questions.

Senator McIntyre. The chart on small business share of R. & D. procurement—is this part of your statement?

Dr. Davis. Yes; that is the presentation.

Senator McIntyre. Explain it to me, will you please, reading from left to right, your last page here, take fiscal 1977.

Mr. Church. Those last two lines on there are half year statistics. Typically, we find in the first half of a year——

Senator McIntyre. Take it right through.

Mr. Church. Do you have the first or second chart?

Senator McIntyre. I am looking at the second chart.

This is the one I do not understand. I am sure you can straighten me out.

Mr. Church. These are total R. & D. contract awards to small business.

These are prime contract awards, and these are the various years and these are the total percentages, identified to research development and management and support.

Management and support gets more into the test and evaluation (T. & E.) aspect than it does into the R. & D. aspect. It is our way of

DOD of all agencies is very concerned about industrial innovation, because we have the Soviet challenge before us at all times, and we firmly believe that our edge against that Soviet challenge comes out of our technological base and our new innovation. We are very concerned about this. We do agree that much of that is a direct derivative of the work done in many of our small businesses, not only with respect to the work we give them directly, but also of the tremendous work they do with many of our large prime contractors, the giants of industry.

We do look at our record as not being as good as we would like.

Our record has been consistent over the last 6-year period. We have consistently awarded most of the prime contracts to the large firms. The prime contracts awarded to small business in the R. & D. area are approximately 5.5 percent annually of the total dollars available. The award to small R. & D. firms increased over the 6 years from $256 million to $389 million. We did hear some of the earlier people commenting on the involved process of obtaining contracts from the DOD, and I believe you yourself commented on it.

Much of the problem deals with socioeconomic statutes which the Congress has levied on us. In many cases, I support their purpose as well. However, they do tend to certainly complicate the process, with the result there are many areas that we cannot make reductions in because of our obligation under those statutes.

However, we have started many new initiatives in the reduction area that we believe are available to us without getting into conflict with the statutes.

I would like to give several examples of such initiatives. The first would be the new acquisition regulations we are now in the process of writing. This is an approximately 14-month process of attempting to significantly reduce the volume and complexity of an acquisition regulation that has been with us for many years, and has grown immensely over that period of time. We have zero-based our whole acquisition regulatory process and are basing it on those documents with which we believe small business are most familiar, namely, the uniform commercial code which will serve as the fundamental base for rewriting the acquisition regulation.

In addition, my office is responsible for some 40-plus thousand specifications and standards. In this regard, we are going through an arduous review of every single one of them over the next few years.

In addition, in deleting those that are no longer applicable, or overcomplicated, we have adopted some 1,775 new specifications and standards over the last 3 years which have come from industry itself.

Most of these will take the place of standards now in existence. We believe industry does understand them and can use them.

We believe that as far as small business is concerned, we are not putting forth any new complicated specifications or standards.

If the business manufactures something that we find satisfactory for our needs, we just buy it. We call that our commercial commodity acquisition program. This is a program which is in the process of expanding very rapidly. Hopefully small businesses will be able to profit by them not having to go through a complicated request for proposal (RFP) procedures but can simply sell their product in a very simplified form through the purchase order procedures.

I will not go into detail other than to say that I was very pleased with what I heard Dr. Morse say this morning about that relationship; I could not agree with him more.

I chose to illustrate my concern on this particular subject, by referring to the Small Business Development Center legislation, which I think is in the final stages of enactment. I believe that my testimony illustrates how a healthy Government-academic-private sector partnership can be applied to the SBDC program.

Finally, Government has a central role in recognizing the qualifications of laboratories so they can be more widely utilized.

I refer to my frustrations of the failure of the Government to come up with any kind of meaningful laboratory accreditation program. I wish I had more time to talk about how this contributes to innovation, but, believe me, I have thought it through, and it definitely does, and it is simply another case where the Government has spent so much time talking about the desirability of getting something moving, and we have provided major creative input but there has been no action of significance.

There is much more that could be said about the crucial problem of innovation and small business, but I hope that my testimony this morning will contribute to a better understanding of the problem.

Thank you for affording me the opportunity to present my views.

Senator McIntyre. The committee wonders if, for the record, you could give us three or four examples of where you feel unfair competition from the universities, and I think you also extend that unfair competition to the Government itself, do you not?

Dr. Hess. Yes, there is no doubt. When a request for proposal comes from one Government agency, another Government agency will often respond to it in the same way a private firm would.

I think that NASA is as good an example of any, of a technical capability that has not been dismantled after its mission was completed, and is really engaged in competing with the private sector.

You asked about the universities and not-for-profits.

Such occurs regularly during our day-to-day operation. We observe it in situations that seem trivial, as trivial as when my laboratory makes a quotation to do some routine waste water analyses for a client, and finds that one of the groups bidding is a local municipality, that decided to go into the water testing business in addition to running its own waterplant.

I should mention that the American Council of Independent Laboratories has prepared a memorandum on the subject of unfair competition, which provides comprehensive documentation in relation to that particular problem which we face, and I see no reason at all why this could not be made available to your committee for study.

Senator McIntyre. That would be very good. We could include it in the record, or put it as an appendix to our report, so if it is obtainable, will you please send it to us.

Dr. Hess. I will see first of all whether or not I can do it, and if so, I will certainly arrange to have that submitted to you.

We have lost $10,000 and $20,000 competitive bids to educational institutions for routine analyses, using student labor, equipment bought or acquired through Federal grants. There is no way we can compete

I would like to speak to this a few minutes. As the OMB memorandum makes clear, Government procurement policy presently impedes proper utilization of private sector technically skilled small businesses.

I find it difficult to understand why the recommendations in the OMB memorandum have yet to be implemented, and I was particularly interested in the exchange of conversation that went on with the last witnesses.

Why do I feel such urgency?

My frustrations are really not academic. In responding to governmental needs for my firm's technical capabilities, I am asked to quote a firm price on a project which requires my skills, but whose scope cannot be defined, I am asked to complete innumerable forms that are legally binding yet barely comprehensible, I must agree to accounting audits that will penalize me not only for fiscal indiscretions, but also for honest and legitimate differences in accounting practices, and after all of this, my chances of receiving an award are far less than if I had responded with 10 percent of the effort to a solicitation from a private firm.

Senator McIntyre. That is request for what, request for proposal?

Dr. Hess. That is correct.

Our company has had the disappointing experience in the last 6 months of investing several thousands of dollars in preparing two proposals in response to Federal requests for proposals, only to have the RFP's canceled after the deadline for their submission.

If this represents a frequent circumstance in Federal procurement, it places an inexcusable burden on the small high technology firm.

Mr. Chairman, something simply must be done to uncomplicate the Federal procurement process and make its procurement personnel more accountable.

Senator McIntyre. How do we do that?

We all want to do it, but how do we do it? Presently we have an awful time with the regulatory process of approving the construction of a nuclear powerplant. While I am not a great advocate of nuclear power, and we have been looking at that process, it is absolutely disastrous. And, here we are saying: "Why don't you deal with the private sector, get away from defense, that is a mess, it is just terrible," but that is an awful thing to be saying.

I would lik to keep firms dealing with 50 percent out of their 100 percent of business with Defense; 50 percent in the public sector and 50 percent in the private, that would be all right.

What do we do?

Dr. Hess. We have attended various debriefings where I found the Government agency bureaucrat is in the position you are talking about; he says to be reasonable would be a violation of Government procurement regulations.

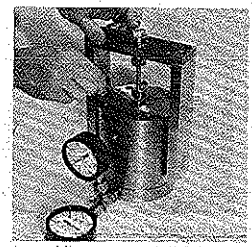
Senator McIntyre. Go ahead with your statement.

Dr. Hess. OK. Something was already stated this morning about the competition from Federal Government agencies themselves. I will pass over that, except to underline that it is a real problem for us.

Unfair competition from universities and not-for-profit institutes is yet another obstacle to the innovation process in the private sector.

This is a complex subject. It is not the purpose of the private laboratories to deny the educational and not-for-profit institutions their

MMR Develops Unique Tester For Sensitive Solder Joints



Massachusetts Materials Research, Inc., Worcester, MA, designed and built eight of these ultrasensitive testers for solder measurements in connection with the Saturn missile program.

For the Saturn missile control systems, IBM wished to have specific information about the various types of solders available for making the electrical connections. A solder having the best creep and load relaxation was needed. Also, the optimum thickness of solder to apply had to be determined. Fantastically sensitive measurements of changes of solder thickness in a 0.005 inch thick layer were required. Massachusetts Materials Research, Inc., Worcester, MA, designed and *built* eight ultrasensitive testers, ran experiments for eight months on a demanding time schedule and delivered data unavailable anywhere else in the world.

An Instrumented Doctor Blade For Paper Making

Technologists associated with the paper industry speak a language all their own. But for laymen who have at least toured a paper mill a couple facts about the process are obvious. (1) It proceeds very rapidly — in nine seconds a wet slurry is converted to finished paper, this paper sheet coming off the drying drum at the rate of 50 - 60 miles per hour. (2) The paper is lifted from the rotating drum with a precision set "doctor blade." Any non ideal pressure setting of the blade can result in poor quality paper or excessive wear of the blade.

Enter MEI-Charlton, Inc. of Portland, OR! — The result an instrumented doctor blade that continually senses via a series of strain gauges any deviation in optimum doctor blade pressure at 72 locations across the blade. Another big problem solved by a small laboratory!

Reverse Froth Flotation— A Technique For Sulfur Removal From Coal

The combustion of coals containing a high sulfur content leads to stack emissions high in sulfur oxides. Unfortunately much of our coal reserves, on which we seem to be becoming increasingly dependent for energy, contain significant levels of sulfur, usually in the form of pyrite. Such coals are not usable, in the interest of clean air, unless the sulfur is removed before combustion or the sulfur oxides are scrubbed from the stack gases. Standard Laboratories, Inc. of Charleston, WV has played a significant role in the development of a technique for pyrite removal from coal.

Fine coal froth flotation is a regular technique for removing ash from fine coal. When the coal mixture is treated with various reagents and air, the clean coal comes off the top as a foam while the high ash material settles to the bottom of the cell. Under standard conditions pyrite which is light is part of the foam and is not separated from the good quality coal.

Standard Laboratories' modified froth flotation successfully separates the pyrite from the good coal fraction for many but not all coals. Therefore a laboratory screening test was necessary to test the amenability of various coal samples to the process. Standard Laboratories has developed and proven out such a test device that functions on a .25 - .50 gram sample. Data collected by the application of this screening test to more than 200 test samples indicate that about 50% of the high pyri' coals are amenable to desulfurization by the foam flotation technique.

R&D Committee Members Represent Broad Technical Discipline and Geographic Mix

Joining Dr. Hess on the R&D Committee are the following persons with their laboratory associations.

Mr. Herbert M. Block, United States Testing Company, Inc., Hoboken, NJ; Dr. Philip J. Charley, Truesdail Laboratories, Inc., Los Angeles, CA; Mr. David E. Cinton, Arnold Greene Testing Laboratories Inc., Natick, MA; Mr. Harry Czyzewski, MEI-Charlton, Inc., Portland, OR; Dr. Charles A. Garber, Structure Probe, Inc., West Chester, PA; Mr. Elmer F. Glabe, Food Technology, Chicago, IL; Dr. Lewis E. Harris, Harris Laboratories, Inc., Lincoln, NB; Dr. Ray Hauser, Hauser Laboratories, Boulder, CO; Dr. Bjorn Kvammen, Jr., CT Engineering, Columbus, OH; Mr. Lee I. Nylander, Polytechnic, Inc., Chicago, IL; Dr. John H. Olwin, Trace Elements Inc., Park Ridge, IL; Mr. Robert L. Schwein, Testing Engineers, Incorporated, Oakland, CA; Dr. Roger W. Truesdail, Truesdail Laboratories, Inc., Los Angeles, CA; Mr. John C. Young; Trace Analysis Lab., Inc., Hayward, CA.

Food Industry Benefits Broadly From Food Technology Laboratory's Research

Food Technology Laboratory's Process Engineering Laboratory.

In its thirty years of activity, Food Technology Laboratory of Chicago has performed hundreds of research, development, and engineering projects for many scores of clients in the food industry. The scope of these projects covers every major aspect of the food process industry. Work is performed for clients ranging from the industry giants to very small operators, each interested in developing a concept into a commercial product made by a commercially-feasible process. In-house development of Food Technology Laboratory's own ideas and concepts to the point of patent establishment or other controlling features, is also a major objective.

A number of important developments have come from this laboratory. One is a unique thin film drying process by which honey and other sugar syrups can be dehydrated. This process is the only one in its field. Dehydrated honey and molasses thus produced are widely used by bakeries and other food processors.

Another important area of work has been research into methods and substances which can be used to protect food supplies against destruction by molds and bacteria. One such compound developed by Food Technology Laboratory is being extensively used in human foods. More recently, its use has spread to the preservation of corn and cereal grains, hay, silage and animal feeds. It is a major find in the fight to provide more food for more people. Attesting to the wide scope of thinking and inventive ability of Food Technology Laboratory are the more than fifty United States and foreign patents bearing the name of Elmer F. Glabe, who is the founder and director of Food Technology Laboratory.

Air Quality Regulations Preceed Reliable Air Monitoring Procedures

The national concern over air pollution which seemed to develop overnight and to be translated into regulations almost as rapidly resulted in the definition of many air quality standards for which no reliable measurement techniques existed. For this very reason any laboratory that proposed to offer analytical and consulting services in the field of air quality has been drawn into a field which requires constant method development or modification in order to meet the needs of each individual situation. Such is still true despite the existence presently of a battery of standard air test methods. Two ACIL members who have major commitments to this broad multidiscipline field are Polytechnic Inc., Chicago, IL, and York Research Corporation of Stamford, CT. Each covers in depth such widely diverse areas as source testing, ambient air monitoring, the application of computerized dispersion modeling in the prediction of the effects of a given source (e.g., a factory smokestack) on ambient air quality and the characterization of organic and odiferous air pollutants. Further York Research offers in-depth technical services as air quality relates to industrial hygiene. The latest ACIL Directory lists 37 member laboratories from across the United States who possess prime competence in the field of air pollution, a good indication of the responsiveness of the independent laboratory community to changing client needs.

Research Includes Asphalt Materials

Chicago Testing Laboratory, Inc., Northbrook, IL, has been involved in research and development of asphalt materials for more than 50 years. Some of its activities have involved the following:

Development of a catalytic air-blowing process for producing roofing asphalt from petroleum flux. A patent was granted and later assigned to a major oil company. This process is still in use by a number of roofing manufacturers in this country and Europe.

Developed a test method for recovering the asphalt from a paving mixture so that it could be tested for physical properties. This is now ASTM Standard D-1856 "Standard Method of Test for Recovery of Asphalt from Solution by the Abson Method" and is universally used by laboratories involved in testing asphalt paving materials.

In the 1930's CTL introduced a major construction equipment manufacturer to the asphalt paving industry and served as a consultant to the company in the development of the first traveling asphalt paving machine, the principles of which are now used by most of the current equipment.

During the past four years CTL has also carried out research and development projects for this same manufacturer resulting in the design of a new concept in an asphalt drum mixer for producing asphalt paving mixtures.

CTL did considerable development work for another construction equipment manufacturer in designing hot-storage equipment and processing which is now a standard component of most asphalt paving plants.

Research By-Product Proves An Effective Fungicide

During the course of its research for the International Copper Research Association, Inc., Lancaster Laboratories, Inc., Lancaster, PA, discovered a useful new material as a by-product of its effort.

This was the origin of FT-2, a spray-dried Bordeaux mixture used as a fungicide for many types of plants, including grapes, apples, and rice. In field tests, rice yields increased 4 - 27% after application of FT-2. Such a substantial increase in rice production could have a significant effect on the world's food supply since rice is the world's most important food crop.

When compared to competitive products, FT-2 was found to be more effective as a fungicide. In Italy where FT-2 is now produced at the rate of 30,000 tons/year, this fungicide has successfully replaced competitive organic fungicides.

Lancaster Laboratories uses this atomic absorption spectrophotometer to detect trace elements in a variety of materials. One special project involved analysis of copper content of laboratory ecosystems and experimental copper formulations used in fungicidal, algicidal, herbicidal, and molluscicidal research programs with INCRA.

Analysis, The Basis For All Other Technical Disciplines

Prerequisite to any significant product or process research and development is the ability to measure the properties of those substances to which the research relates. An organic chemist, for example, would find it extremely difficult to develop a new plastic substance for a specific end use if he were not able to define the physical and chemical properties essential for that application. Neither would an engineer feel confident in building a new bridge or building if he were not able to measure first of all the properties of the soil onto which it is going to be set. Because of the basic function of measurement, inspection, and analysis in our technological society and the frequent need to have such analysis performed by an independent disinterested third party, the independent laboratory community exists.

Analytical science can be divided into two categories — the development of measurement techniques and their routine application. The present generation of analysts is the recipient of a wealth of knowledge in this area from past generations, which allows them to perform a wide variety of testing procedures using techniques developed and standardized by others. But technology is not static. New products are continually being sought to fulfill new purposes. And when this occurs, the analyst is called upon to develop new systems of measurement. Many independent laboratories find themselves in exactly this position as they strive to serve the ever changing needs of their clients. The development of new analytical techniques and the demonstration of their applicability and validity draws upon the creative ability and depth of past experience of those persons whose specialty is some phase of analytical science.

Throughout this Bulletin the reader will find interspersed significant examples of analytical method research and development as a means of calling attention to the essentiality of such efforts to our country's total technological development.

Research Brings New Instrument

The axiom "Necessity is the mother of invention" has held true in still another case. Corning Laboratories, Inc., Cedar Falls, IA specializes in environmental analysis and has thus been called upon to monitor hydraulic flow in waste water systems under a variety of conditions. The AquaCorder, an electronic water level sensing and recording instrument, is used in conjunction with a conventional flume or V-notch weir as a direct monitor of water flow. It senses water level changes to the nearest 0.2 inch an records the data directly onto magnetic tape. A readout accessory converts the accumulated magnetic signals during a 24-hour period or longer to a digital form. The new product is protected by a patent and owned by Corning.

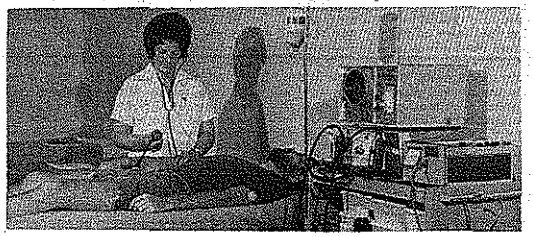
Harris Laboratories Pursues Drug Research

A unique activity of Harris Laboratories is human drug research. Human volunteers are confined in a specially designed unit providing medical evaluation facilities, recreation and sleeping quarters, food preparation and serving areas, and various support laboratories.

In this clinical facility, studies are conducted to evaluate the efficacy and safety of new or presently marketed pharmaceutical and cosmetic products. A spectrum of research is conducted ranging from blood level comparisons to dose tolerance evaluations.

Data from this type of research is used to assess the value of new drug entities, to support new drug applications, to augment existing product data, and to aid in product improvement.

Several other ACIL laboratories such as Hill Top Testing Services and Industrial Testing Laboratories (New York) also provide similar unique research services.

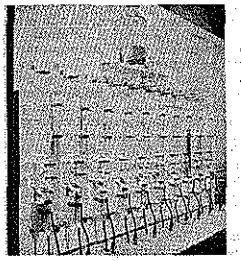


Human volunteers undergo routine medical checks following drug administration.

Fly Ash Replaces Cement In Concrete

Our simultaneous commitment to cleaner air and increased reliance for the near term on coal as an energy source is giving rise to increasing quantities of by-product "fly ash." Although considered for a time as a waste requiring disposal, efforts have been put forth in recent years to utilize it more creatively. One of these efforts which has borne fruit was carried out by Engineers Testing Laboratories, Inc. of Phoenix, AZ. The development of a new mix design procedure has permitted the replacement of a portion of the cement in Portland Cement Concrete with fly ash. The ongoing project supported by the Arizona Department of Transportation has now progressed into the field test stage far enough to provide encouraging first results.

45th Anniversary



Special liquid-liquid extraction and extract concentration apparatus developed by Truesdail Laboratories, Inc., Los Angeles, to use for the detection of drugs in biological fluids has been made available to members of the Association of Official Racing Chemists, an international organization.

Truesdail Laboratories, Inc., Los Angeles, is observing its 45th year as an independent consulting, testing and research organization.

The laboratory, a charter member of ACIL, is active in the fields of chemistry, microbiology, engineering, and forensic science.

Dr. HESS. My name is Dr. Earl H. Hess. I am founder and president of Lancaster Laboratories, Inc., located in Lancaster, Pa.

Lancaster Laboratories is a small independent laboratory providing research, development, analytical, and consulting services in the areas of agricultural production, processing and consumption of food, environmental issues, and industrial processes.

Our clients are individuals, small, medium, and large private businesses, governmental agencies, trade associations, consumer organizations, and colleges and universities.

I started Lancaster Laboratories in 1961 with a staff of three persons; the staff today is 40, 32 of whom are full-time employees. Eighteen of these individuals are professionals holding degrees in chemistry or biology.

In 17 years of business, Lancaster Laboratories has never laid off a single employee for lack of work.

In 1978, we opened a branch laboratory in Waynesboro, Pa., to serve the needs of agricultural enterprises and industries in south central Pennsylvania and parts of Maryland, Virginia, and West Virginia.

Although the majority of our clients are located within a 100-mile radius of one of our laboratories, some of the unique expertise developed by our company is utilized by national and international clients. A scope sheet attached to this testimony describes our areas of expertise more fully.

I should also state that our business is a family business. My wife has been involved since its inception, my son has been involved for 3 years, my son-in-law and daughter are in the process of getting involved.

I also serve as the chairman of the research and development committee of the American Council of Independent Laboratories, Inc., chairman of the eastern division of ACIL and as a member of its government relations committee.

I have attached to my statement a copy of our fall 1976 ACIL bulletin that is devoted to the research and development activities of member laboratories.

[The document follows:]

hinder achieving national goals in innovation, technology transfer, research and development and analytical problem solving tasks.

There is much more that could be said about this crucial problem of innovation and small business, but I hope that my testimony this morning will contribute to a better understanding of the problem. Thank you for affording me the opportunity to present my views.

assist other small businessmen. That logic is based on the fact that one small businessman relates ideally to another and that the track record of academia in solving immediate small business problems is not impressive. It is further based on the fact that it makes little sense not to maximize the role of one of the most valuable resources relative to the whole innovation process (high technology professional services firms) in the interest of assisting other small business.

The PENNTAP model reflects the right kind of partnership in implementing an SBDC type program. Central in the PENNTAP program is the monitoring by a government agency (Pennsylvania Department of Commerce) of a program that is unique in its utilization of the academic and private professional service resources within the state to deliver technical services to those in need of them.

Unless a joint ~~university/private sector~~ plan is devised in each area where an SBDC is established, under the auspices of SBA and the appropriate state economic development agency, this Committee's hopes to create a constructive new program of assistance to small businesses which achieves innovation goals will not be realized.

Finally, in addition to developing fundamental data about small technically oriented laboratories, government has a central role in recognizing the qualifications of such

A second suggestion is in the form of a plea to develop more incentive for the private sector to be creative and take the risk that accompanies it. I want to say first of all how much I appreciate and have benefitted from Federal tax policy that has reduced the corporate net income tax on the first $50,000 of profit and the investment credit provisions on both new equipment and new jobs. I sincerely believe that I and many other small businessmen have been good stewards of the funds that these tax credits have left in our hands, by plowing them right back into the economy at very strategic points. At this stage in life I am concerned with the more long term continuity of my business enterprise, its orderly transition to new management while remaining independent and a realization of a fair return on my life long investment of effort. I am not unique in this concern, and I applaud the efforts of Senator Nelson and his Committee for their past efforts to assist small business and encourage further attention and support for proposals to create proper tax and financial incentives for small businesses.

I have already discussed the very special burdens imposed on small businesses by government regulations, including the procurement of technical services. I appreciate the need for regulations to protect the health, safety and welfare of the consumer, and procurement regulations aimed

entities. With more than fifty percent of Federal research dollars being expended through non-private facilities, the problem of an innovation drag is easily grasped. Reallocate these funds to small business high technology firms and innovation will be stimulated.

Unfair competition from universities and not-for-profit institutes is yet another obstacle in the innovation process. This is a complex subject. It is not the purpose of the private laboratories to deny the educational and not-for-profit institutions their proper place, but we do object to the dilution of their important responsibilities in basic research and education by their direct competition with us in the commercial marketplace. When we must compete with them for government and private research funds, we insist that Federal funds be allocated without bias and tax-favored status be adequately considered in evaluating proposals from these institutions.

The consumer movement has had a far reaching impact on the business community and its ability to innovate. Case in point -- the explosion of product and professional liability claims. Insurance companies are rightfully alarmed by this situation and are refusing professional liability coverage to many small high technology laboratories. It is disturbing to have to risk the business equity resulting from a lifetime of effort with each report that emerges from

Some problems are unique to small independent laboratories and related technical professional services firms, one example being the special requirements of government procurement of such services. As the OMB memorandum makes clear, government procurement policy presently impedes proper utilization of private sector technically skilled small businesses. I find it difficult to understand why recommendations in this OMB memorandum have yet to be implemented, particularly since previous reports had reached similar conclusions. Now a new government-wide review of Federal policies relating to small businesses and innovation is underway which may well be an excuse for continued inaction. If nothing else can be accomplished by these hearings, I would strongly hope that actions to encourage innovation can accompany, not follow, this Presidential review.

Why do I feel such urgency? My frustrations are real not academic. In responding to governmental needs for my firm's technical capabilities, I am asked to quote a firm price on a project which requires my skills, but whose scope cannot be defined, I am asked to complete innumerable forms that are legally binding yet barely comprehensible, I must agree to accounting audits that will penalize me not only for fiscal indiscretions, but also for honest and legitimate differences in accounting practices, and after all of this,

small business. Too often I have heard research and development capabilities described in terms of a facility -- the bricks and mortar, instruments and apparatus that collectively comprise a laboratory. Whenever I take a visitor on a tour of our laboratory on a weekend, I feel uneasy because I realize that he is failing to see our most important asset, our people. What qualities does one find in those persons who own, manage, and work in small independent technical laboratories? They are not the castoffs of other employers; rather they are an elite, competent, ambitious, hardworking group of scientists, willing to let their productivity dictate their remuneration and professional advancement. Many are rugged individualists who function well in a relatively unstructured environment. Is it any surprise, then, that small high technology businesses are synonymous with innovation?

III. What Has Gone Wrong In Recent Years?

There are signs all around us that the United States is slowly losing its leadership position in the world economy. One major contributing factor is that the well of innovation is drying up. I detect several reasons, some obvious, others not.

First, the general climate for small business has deteriorated significantly. Establishing my kind of business was not easy in 1961. In 1978, it would be even more difficult. The recent record of failures during the first year or two

I should also mention by way of introduction that I was privileged to be a part of the United States delegation to an international conference on Government-Industry Cooperation in Technical Innovations in June 1977 at Geneva. For that opportunity, I am indebted to the National Science Foundation (NSF), and I commend NSF for including in its delegation a representative of the small high technology business community.

In the time available to me this morning, I would like to examine the role government has played in assisting or limiting innovation in the small business sector and suggest actions to stimulate innovation by small high technology firms.

II. Innovation and Small Business

Comprehensive studies conducted over the last ten years have documented the extraordinary contribution that individual inventors and small businessmen have made to the technological development of this nation. The OMB memorandum dated March 10, 1977, has established, however, that there has been a steady decline over the last decade in the role of small businesses in the innovation process and the need for Federal leadership in creating a better environment for innovation to flourish. I would like to share some personal views on my understanding of innovation and why small businesses can so productively contribute to the innovation process.

I. Introduction

Mr. Chairman and Members of the Committee:

My name is Dr. Earl H. Hess. I am founder and President of Lancaster Laboratories, Inc., located in Lancaster, Pennsylvania.

Lancaster Laboratories is a small independent laboratory providing research, development, analytical and consulting services in the areas of agricultural production, processing and consumption of food, environmental issues and industrial processes. Our clients are individuals, small, medium and large private businesses, governmental agencies, trade associations, consumer organizations and colleges and universities. I started Lancaster Laboratories in 1961 with a staff of three persons; the staff today is 40, 32 of whom are full time employees. Eighteen of these individuals are professionals holding graduate degrees in chemistry or biology. In seventeen years of business, Lancaster Laboratories has never laid off a single employee for lack of work.

In 1978, we opened a branch laboratory in Waynesboro, Pennsylvania, to serve the needs of agricultural enterprises and industries in South Central Pennsylvania and parts of Maryland, Virginia and West Virginia. Although the majority of our clients are located within a 100 mile radius of one of our laboratories, some of the unique expertise developed

Well, we may have some questions for the record, Mr. Secretary, but in view of our time constraints, we thank you for your interesting testimony this morning.

Dr. BARUCH. Thank you, Mr. Chairman.

Senator MCINTYRE. Our next witness is Dr. Earl H. Hess, chairman, research and development committee, American Council of Independent Laboratories.

Dr. Hess, we are pleased with your presence. You have a long statement, so I suggest you try to hit the important points, is that agreeable?

STATEMENT OF DR. EARL H. HESS, CHAIRMAN, RESEARCH AND DEVELOPMENT COMMITTEE, AMERICAN COUNCIL OF INDEPENDENT LABORATORIES

Dr. HESS. That is exactly my intention.

My statement is rather long; it developed into something longer than I had anticipated.

Many of my points have already been made, and I would, therefore, like to "walk through" my testimony, emphasizing only what I feel is most significant.

Senator MCINTYRE. Very good.

Your prepared statement will be made a part of the record.

[The prepared statement of Dr. Hess follows:]

cent big report. I think the panel, after one or two meetings would realize that there are things that we could start to do now.

I think it is entirely within the purview of our two committees.

Representative BRECKINRIDGE. I could not agree more. Let me go one step further. I believe the function of this hearing is simple: To give you a sounding board and an opportunity to be heard and to develop within the executive branch those programs.

Your function is to receive that friendly assistance and get on the ball.

What we are saying is this: Let us constitute an ad hoc action group in addition to a study group, and if you do not find within the 300 volunteers that you have a consensus as to everything that has been reported and that is available to you, go forward with what you find a consensus on and set aside for further study those areas in which there is not a consensus; and I suggest you will save 18 months and billions of dollars worth of capital assets, and you might get the President out of his depression, and you might generate the jobs that will make it unnecessary for me to vote for deficit financing and cause the economy the problems it is generating; and you might start the whole thing.

Dr. BARUCH. I could not agree with you more, Mr. Breckinridge.

Representative BRECKINRIDGE. What can we do to facilitate this?

Dr. BARUCH. We have told each of the study groups that the project is to be finished, that the last recommendation is to go out on April 1 of next year—which incidentally is 8 months, not 18 months away. We expect, however, that those areas where there is little dispute will go forward for review well before then. The steering committee and the coordinating committee have accepted this policy—that recommendations on which there is little dispute will go forward to the President piece by piece during the period.

We do not expect to wait until the country falls apart to get our recommendations in. We are as interested in this process as you are.

Representative BRECKINRIDGE. I am delighted in what I am hearing, I want you to understand, as I know Senator McIntyre is.

Let me say my committee will track that progress, and we are going to track it for the purpose of helping you accelerate; and I trust the channels of communication will be kept open so that we can facilitate your work in those areas where you are encountering difficulties.

Dr. BARUCH. They will not only be kept open, but it is my hope and clear indication from both staff members and Members of Congress that they would like to sit in on some of these committee meetings and subcommittee meetings, and I assure you that you are most welcome to.

Representative BRECKINRIDGE. I thank you. If I may, I want to say I was sorry to have missed Professor Morse's testimony, and I look forward to saying hello to him and shaking his hand.

I have been quoting him—I hope not misquoting him—for a number of months around the country; he is the authority for the report indicating what some 16 of what I would call innovative technology companies did in terms of their acceleration of market creation, of acquisition, and profits and jobs. You are all addressing the funda-

Senator McIntyre. What role do you envision will be made by representatives of small business in the Presidential review—those inside and outside the government? I understand SBA will be one invited to participate, but I mean outside the SBA.

Dr. Baruch. Well, big businesses are rapidly starting to realize the importance of small business to their survival. On the individual panels we have had volunteers from small business for every one of the individual panels, and we have volunteers from the venture capital industry, which is critical to the development of new small business, so we will get their voices heard.

Senator McIntyre. I thank you.

There are some things going on on the floor, and every place else.

I will be happy to yield to my colleague from the House of Representatives.

Representative Breckinridge. Thank you very much. I am sorry I missed your earlier testimony, but they are going on on our side as well, and now they are going over in the Senate as well.

I am interested in the examination of not only you, but of other witnesses concerning the OMB report that has been referred to here, and I think you are familiar with that report.

Dr. Baruch. Not only familiar with the report, but I am very familiar with Jack Rabinow.

Representative Breckinridge. Perhaps I misunderstood the situation, but unless this report had been released today by this committee, it would still be hiding away somewhere, a year after its publication; I do not like the word "suppressed," but what has been happening with this report, and why have we not had it in the public domain, and why has it not been implemented?

At what point did it die? At whose direction, if you know?

Dr. Baruch. The answer to those questions I cannot give you.

I do not know what happened to that report in the official circles.

What I can tell you though is that the ideas of people like Mr. Rabinow, who is the most prolific Federal inventor, will be very heavily incorporated into the thinking of this current study.

It was piecemeal / doesn't suffice

I think one of the problems we have, Mr. Breckinridge, is that for us to come up with piecemeal solutions would not suffice. What we are trying to do in this study is not to put together a disjointed set of options, but a series of integrated strategies, one strategy that says how do we help small business, how do we help high technology business, large or small, how do we help businesses that are attacked by foreign trade.

Representative Breckinridge. Well, I do not want to get away from this, Dr. Baruch, but let me follow that question further.

What do you contemplate as being your criteria in determining what the U.S. economy and its defense requirements are? What criteria will you be using in arriving at that determination? What criteria will you use in determining to what extent the capabilities of 225 million Americans are? Using the executive department's determination as to the value of this, in financial constraints, what devices and techniques are available to development to the maximum, if the resources are available, which we obviously are not utilizing at present?

G 1

Task Force Executive Committee

The Task Force Executive Committee is comprised of individuals at the Assistant Secretary level who, on behalf of their departments, agencies, or offices serve as chairpersons or co-chairpersons of the Interagency Task Forces. The Committee is chaired, on behalf of the Secretary of Commerce, by the Assistant Secretary of Commerce for Science and Technology.

The Task Force Executive Committee will monitor the ongoing work of the Interagency Task Forces, assure the integration and coordination of their efforts, and, upon receipt of the task force option papers, will be responsible for approving their transmission to the Steering and Coordinating Committees. In carrying out its tasks, the Committee will work with appropriate representatives of other Federal Departments and Agencies.

F 7

Domestic Policy Review
Industrial Innovation

Government Task Forces	Suggested Membership
Economic and Trade Policy	Treas, chair USDA DoC SBA CEA OMB SEC DoS NSC DoD CIA Ex-Im Bank STR NASA DoJ
Environmental, Health, Safety Regulations	OMB, chair HEW CPSC SBA DoT DoC Treas EPA CEA DoL
Federal Procurement and Direct Support of R&D	DoC, co-chair DoD, co-chair DoT DoE HEW NASA OSTP NSF GSA OMB SBA

F 5

OPTION ANALYSIS

I. Issue/Problem Addressed

II. Option

III. Type of Innovation Affected: level and direction of activity

- o Product
- o Process
- o Capital-Embodied
- o People-Embodied

IV. Characteristics of Firms Affected: level and direction of impact

- o Vertically Integrated to Non-integrated
- o Start-up to Large
- o Domestic
- o Multinational

V. Characteristics of Industries Affected: level and direction of impact

- o Industrial Sector
- o Concentrated to Disaggregated
- o Early Product Life Cycle/Late Product Life Cycle
- o International

VI. Benefits

- o Firm Specific
  - profitability
  - process efficiency
  - product quality
  - product range
  - market span
- o Industry Specific
  - competitiveness
  - start-ups
  - growth
  - market span
- o Resources
  - substitution
  - conservation

and independent agencies. Final assignment to task forces will be based upon a review of the agency-specific review papers and upon an agency's determination that it has a significant interest in or influence upon the issue/option area to be addressed by the task force. A preliminary suggestive list of the membership of each task force is attached along with proposed chairing or co-chairing agencies.

Each task force will convene formally at the Assistant Secretary level. It will be assumed that the option papers, as forwarded to the Task Force Executive Committee, reflect the position of the participating agencies.

Staff

Each agency chairing or co-chairing a task force will be responsible for the assignment of a full-time senior staff person to coordinate the work of the task force and to act as the Federal Control Person for the parallel Private Sector Subcommittee, thereby assuring the continuity of the effort and the careful consideration by task force of the Advisory Committee input to the task force. It is also assumed that the administrative and support requirements of each task force will be provided for by the chairing and participating agencies with the assistance of the Department of Commerce.

All other agencies participating in a task force will be responsible for designating a senior policy analyst who will be responsible for the ongoing work of the agency and will work with the chairperson's designee as required to develop and draft the option papers of the task force.

As appropriate, a senior staff person of the Center for Field Methods of the National Bureau of Standards will assist each task force in the development of the implementation and evaluation plans for each option.

F 1

Interagency Task Forces

Purpose

The purpose of each of the interagency task forces is to review and analyze the singular and collective effects of specific Federal programs and policies upon industrial innovation in its defined issue/option area. They will formulate specific, focused options and state the options relation to other national goals (such as productivity, inflation, employment, the balance of trade, and environmental protection). Such options will address both firms' abilities to innovate and their decision to innovate.

There are five interagency task forces and each will address one of the following issue/option areas:

- Economic and Trade Policy
- Environmental, Health, and Safety Regulations
- Federal Procurement and Direct Support for Research and Development
- Patent and Information Policy
- Regulation of Industry Structure and Competition

In particular, the writeup of each policy/program should include the following:

1. Policy/Program Name

2. Policy/Program Description
   - purpose and scope
   - legislative authority
   - funding (FY 77-78-79)
   - history

3. Impacts on the Innovation Process
   (see strategy statement and option outline (p. F5))

4. Interactions with other Government Policy and Program Areas

Federal Departments and Agencies

The responsibility of the individual Federal departments and agencies is both to develop information and analyses on an individual basis and to contribute to the collective work of the interagency task forces of which they are a part. This section describes only the individual agency responsibilities. The department or agency responsibilities deriving from task force membership are detailed in the section on Interagency Task Forces.

Upon the approval of the Industrial Innovation Coordinating Committee, Federal departments and agencies, including offices within the Executive Office of the President, and independent Federal agencies will be requested to conduct an inventory and analysis of their current programs and policies and of completed research to determine the effect of their activities upon industrial innovation. (The National Science Foundation will include a summary of relevant knowledge developed in the studies supported by the Foundation.) In general, each agency will provide the following categories of information to the Coordinating Committee by October 15, 1978:

- Specifications of agency programs and policies which are viewed as having either a positive or negative effect on industrial innovation.

- A specification of the industries, types of firms and types of innovation affected by each agency and a quantitative or qualitative assessment of its impacts upon industrial innovation.

- A quantitative or qualitative assessment of the contribution which each specific program of policy impacting negatively upon the innovation process makes to the attainment of the agency's goals or the carrying out of its mission.

- A determination and assessment of alternative approaches to the realization of the agency's goals which would have a more positive impact on the innovation process. Such determination may, for example, be based in part on an assessment of the approaches of foreign governments to the attainment of similar ends.

- A determination of programs and policies which might be adopted in conjunction with current programs and policies to benefit the innovative process. A rough cost/benefit analysis should be included where possible.

UNITED STATES DEPARTMENT OF COMMERCE

Office of the Secretary C 10.

ADVISORY COMMITTEE ON FEDERAL POLICY ON

INDUSTRIAL INNOVATION

Notice of Establishment

On June 2, 1978, it was announced by notice published in the Federal Register (43 FR 24116) that it was anticipated that the Secretary of Commerce (the Secretary) would propose the establishment of the Advisory Committee on Federal Policy on Industrial Innovation.

After consultation with the General Services Administration and in accordance with the provisions of the Federal Advisory Committee Act (5 U.S.C. App. [1976]) and Office of Management and Budget Circular A-63 of March 1974, the Secretary has determined that the establishment of the Advisroy Committee on Federal Policy on Industrial Innovation is in the public interest in connection with the performance of duties imposed on the Department by law and by the Presidential Directive dated May 9, 1978 (Memorandum to The Secretary of the Treasury, et al. from Stu Eizenstat, subject Issue Definition Memorandum; Federal Policy on Industrial Innovation.)

The Committee will advise the Secretary of the views of its members with regard to federal policy options designed to increase significant industrial innovation in the United States as required by the Presidential Directive, dated May 9, 1978.

The Committee shall consist of approximately 125 members to be appointed by the Secretary to assure a balanced representation of such interests as industry, business, academia, labor, consumers, environmentalists and other public interests. Nominations for membership will be generally solicited by notice in the Federal Register.

C 8

UNITED STATES DEPARTMENT OF COMMERCE

CHARTER OF

ADVISORY COMMITTEE ON FEDERAL POLICY ON

INDUSTRIAL INNOVATION

Establishment

The Secretary of Commerce (Secretary) having determined that it is in the public interest, in connection with performing the duties imposed on the Department by law and by the Presidential Directive, dated May 9, 1978 (Memorandum to The Secretary of the Treasury; et al. from Stu Eizenstat, subject Issue Definition Memorandum; Federal Policy on Industrial Innovation) hereby establishes an Advisory Committee on Federal Policy on Industrial Innovation in conformity with the Federal Advisory Committee Act, 5 U.S.C. Appendix 1.

Objectives and Duties

1. The Committee will advise the Secretary of Commerce of the views of its members with regard to federal policy options designed to increase significant industrial innovation in the United States as required by the Presidential Directive, dated May 9, 1978. The Committee will operate through subcommittees of its members.

2. The Committee will draw on the expertise of its members and other appropriate sources in order to provide advice and make recommendations to the Secretary.

3. The Committee will function solely as an advisory body and will conform fully with the provisions of the Federal Advisory Committee Act.

Members and Chairman

1. The Committee shall consist of approximately 125 members to be appointed by the Secretary to assure a balanced representation of such interests as industry, business, academia, labor, consumers, environmentalists and other public interests. Nominations for members will be generally solicited by notice in the Federal Register.

2. The Chairman will be the Secretary of Commerce.

Administrative Provisions

1. The Committee will report to the Secretary of Commerce.

The Federal department or agency chairing the parallel interagency task force will assign a staff person to each of the Private Sector Subcommittees as the Federal Control Officer. The Department of Labor, in addition, will provide the control officer for the Labor Subcommittee, the Department of Health, Education and Welfare for the

Public Interest Subcommittee, and the National Science Foundation for the Academic Subcommittee. The members of the subcommittees themselves will undertake the development and writing of their subcommittee reports. Finally, it is noted that the Department of Commerce will reimburse those who so request for travel and out-of-pocket expenses in accordance with current Federal guidelines for advisory committee activities. However, no consulting fees or honoraria will be paid to Advisory Committee members.

Upon submission of their final drafts within two weeks of the last joint seminar, the Advisory Committee will be terminated, thereby ending public participation in the study.

- What creative opportunities does labor see in the industrial innovation process and how can Federal actions help realize those opportunities?

- What specific programs and policies of the Federal Government inhibit innovation in various types of firms in different industrial sectors? Is this detrimental to labor and to the Nation?

- What specific changes in Federal programs and policies would labor support or recommend in order to improve the innovation process in specific industrial sectors?

In addition to the generative role to be played by the Labor Subcommittee, it will also review the papers of the Private Sector Subcommittees (which will be transmitted to it two weeks prior to each of the joint seminars). It is important that the Public Interest Subcommittee formulate and transmit its written reactions on each of the private sector position papers with two weeks after each seminar.

The Public Interest Subcommittee should address the following questions:

- What are the specific concerns of the public interest representatives with regard to innovation, and, given those concerns, what programs and policies might the Federal Government pursue to address these concerns?

- What creative opportunities do the public interest representatives see in the industrial innovation process and how can Federal actions help realize those opportunities?

- What specific programs and policies of the Federal Government inhibit innovation in various types of firms in different industrial sectors? Is this detrimental to the public interest?

- What specific changes in Federal programs and policies would public interest groups support or recommend in order to improve the innovation process in specific industrial sectors?

In addition to the generative role to be played by the Public Interest Subcommittee, it will also review the papers of the Private Sector Subcommittees (which will be transmitted to it two weeks prior to each of the joint seminars). It is important that the Public Interest Subcommittee formulate and transmit its written reactions on each of the private sector position papers with two weeks after each seminar.

It is noted that the private sector subcommittees parallel the interagency task forces being formed within the government. The nineth Advisory Committee subcommittee will be an Executive Subcommittee made up of the five chairpersons of the private sector subcommittees. This Executive Subcommittee will function to integrate the work of the five subcommittees and to establish and set forth the priorities of the private sector.

Membership

In accordance with the provisions of the Advisory Committee Act, nominations for membership on the Advisory Committee actively have been sought. A notice soliciting members appeared in the Federal Register, Vol. 43, No. 107, June 2, 1978, and will reappear upon final approval and publication of the Advisory Committee Charter within the next week. In addition, there is an independent effort to identify suitable industrial participants involving the Industrial Research Institute, the Business Roundtable, and the Conference Board. In general, all participants must have an interest and background in the issue, and a willingness to work. In addition:

- Labor representation must embrace a variety of unions representing a diverse labor base, including, for example, those employed in high to low technology industries; those employed in basic industries and consumer industries; those employed in growth and declining industries. This should guarantee the presence on the labor subcommittee of individuals concerned with the full range of specific issues represented among the five issue/option areas to be addressed by the private sector task forces. The DoL will be asked to help identify labor participants.

- Public interest representatives must be drawn from both national and grass-roots organizations and must represent at least the environmental, consumer, and economics in the public interest concerns.

B 1

Steering Committee

Due to the complexity of the subject under review, the wide range of policy issues which will be considered, and the number of agencies involved in the effort, a steering committee has been established at the Cabinet level to assure close oversight of the DPR. The Steering Committee is chaired by the Secretary of Commerce and its members, drawn from the Coordinating Committee, include:

Assistant to the President for Domestic Affairs & Policy
Science and Technology Adviser to the President
Director, Office of Management and Budget
The Secretary of the Treasury
Chairman, Council of Economic Advisers
The Secretary of Defense

In addition to fulfilling their responsibilities as members of the Coordinating Committee, the Steering Committee members will meet every four to six weeks to review the progress and direction of the study. Among other things the Steering Committee will be responsible for approving any necessary modifications of the work plan and for refining the issues and establishing the priorities of the Task Forces. It is anticipated that the Steering Committee will work closely with the Task Force Executive Committee and its chairperson, the Assistant Secretary of Commerce for Science and Technology.

A 1

Industrial Innovation Coordinating Committee

As indicated in Stu Eizenstat's memorandum of May 9, 1978, the President directed the establishment of the Industrial Innovation Coordinating Committee to be chaired by the Secretary of Commerce and to include the following members:

The Secretary of the Treasury
The Secretary of Defense
The Attorney General
The Secretary of Health, Education, and Welfare
The Secretary of Energy
The Secretary of Transportation
Director, office of Management and Budget
Chairman, Council of Economic Advisers
Assistant to the President for National Security Affairs
Assistant to the President for Domestic Affairs & Policy
Special Representative for Trade Negotiations
Administrator, National Aeronautics and Space Admin
Administrator, Small Business Administration
Administrator, Environmental Protection Agnecy
Science and Technology Adviser to the President
Director, National Science Foundation

The organizational meeting of the coordinating committee will be held on July 25, 1978 in the Roosevelt Room of the White House at 1:30 p.m.

The Coordinating Committee is the most senior policy review committee of the DPR and is responsible for reviewing and approving all option papers prior to their transmission to the Domestic Policy Staff and the President. The committee members have the following responsibilities:

o review and approve final work plan, including agency and task force tasking memoranda, prior to the commencement of work by the agencies (completion date, July 31).

o review the reports of the advisory committee and participate in the joint seminar(s) of particular interest and concern to each member's department or agency (completion date, November 1).

o review each of the interagency task force option papers upon referral by the Task Force Executive Committee and the Steering Committee. Upon determining that the position of their respective agencies is accurately presented and that the option papers merit Presidential attention, the

[Social Environment for Industrial Innovation]

Many impediments to industrial innovation do not stem from federal programs. For example, firms may hesitate to introduce process changes for fear of an adverse labor reaction (even though an expansion of employment, though of a different skill mix, may take place due to increased productivity). Similarly, hesitancy may result from public concerns regarding the particular technology. Innovation may also be hindered, some argue, by a failure on the part of colleges and universities to develop entrepreneural skills or to realign curricula or enrollment in the light of discernable demands for scientific and technical skill mixes by industry.

In developing options in this area, there would be a need for the creative identification of such impediments, and for the identification of the range of federal policies and programs which might be developed or redirected to resolve identified systemic and case-specific problems. Illustrative of the type of policy and program options which might be considered are: The initiation of technology education programs to keep labor and the public apprised of the characteristics and implications of emerging industrial technologies; the development of an innovation impact assistance program to provide worker retraining and relocation assistance to employees affected by innovation or to attract new industry to relocate in impacted areas; and the partial targeting of financial assistance programs to colleges and universities in order to maintain a balance between enrollment in scientific and technical disciplines and projected industrial demands.

NOTE: Despite the recognition of the effect of the Social Environment on industrial innovation, there exists some doubt as to the priority to be attached to this area and as to the appropriate approach to dealing with the issue. Therefore, studies will be commissioned to define further the issue and to develop appropriate recommendations for Federal action. These studies will be reviewed by the Advisory Committee and Task Force Executive Committee and a determination will then be made as to the appropriate approach.

policy options might be the consideration of: Provision of appropriate Federal support for the availability of new data bases (e.g. the patent file) and forms of information packaging (e.g. customized collections of agency information); clarifications of government policy on the availability of technical information from the government including issues of agency mission, fee/free availability, data-base compatibility, etc.; strengthening of federally-supported research and systems development on information services especially oriented to the needs of technical problem solvers and policy readers; policy guidelines on international flows of information, especially those which affect foreign trade (e.g. international constraints on trans-border data flows and information helpful to U.S. firms developing technology for international markets) and assistance programs for developing action (e.g. provision of scientific, technical knowledge in measurements standards and resource properties); organization of government policy and services to provide interagency integration in the stimulation of private efforts and to develop and market innovative information services.

The federal direct support of R&D issue/option area will concentrate on the linkage between the R&D activity and the innovation process. The task force will consider the impact of R&D support policy and practice on the utilization and diffusion of resulting innovations in the firm as a result of R&D support in the firm itself, in universities, and in other organizations. Major questions will center on such matters as: The adequacy and appropriateness of programs which relate government support to private abilities to perform R&D in the national interest; the structural characteristics of programs which are most likely to promote the private actions and institutional relationships needed in industrial innovation; the incentives and barriers to individual performance involved in the management of government contracts and projects; and the encouragement provided for industrial utilization of the results of federal R&D.

Illustrative of the types of options which might be considered are: The direct federal support for the establishment of industry-government collaborative R&D programs to focus on the development of potentially significant cross-cutting technologies such as composite materials, anti-corrosion technologies, and joining technologies, or, on the development of advanced production technologies for impacted industries; the establishment of a federal coordinating mechanism to review and generate the integration of related federal R&D efforts across agencies; the establishment of an ombudsman function which would facilitate review of industrial R&D related proposals by the appropriate agencies and would arrange for joint funding of efforts at the interface of two or more agenices; the direct support of environmental technologies for the development of environmental technologies as a corollary to the promulgation of environmental regulations.

In assessing each option developed in this area, careful consideration should be given to the possibility that such programs merely may displace corporate funds which otherwise would have been invested in the innovation.

Environmental, Health, and Safety Regulations

The growth of firms engaged in environmental activities shows that environmental, health, and safety regulations can benefit innovation, the economy, and employment. There also are cases which suggest that such regulations, when met by process changes, can result in increased process efficiency and productivity, which in turn may generate savings greater than the cost of the innovation. Negative effects have also been ascribed to such regulations, resulting from such things as: uncertainty regarding the timing and direction of future regulatory actions; increased lead time associated with the introduction of new products or processes; reorientation of the R&D budgets from improved process efficiency and product development to environmental control; and reduction in the effective, economic life of patents due to delays in introducing new products into the market as a result of regulations.

In developing options in this area, careful consideration should be given to two questions: Can the goals of present and future regulations be achieved in a way which has a less negative impact (or even a positive impact) upon industrial innovation? Can corollary programs be developed to offset any adverse consequences of regulations on industrial innovation in a cost-effective way? Consideration should be given to changes in both the regulatory process and in the content of regulations. Illustrative of the types of options which might be considered are: the development of a regulatory agenda to reduce uncertainties with regard to the focus and timing of future regulations; a development of approach to reduce the time required for market clearance on innovation implementation; emphasis on the development of regulations to restrict the overall level of emissions or effluents from a given industrial site rather than at given points in the industrial process or at given factories; and the development, in concert with regulations, of Federal programs to assist with development of environmental, health, and safety technologies.

Economic and Trade Policy

This committee/task force will deal with the related issue/option areas of economic policy and international and trade policy.

The economic policy issue/option area concerns the availability and cost of capital as they affect firms' abilities and decisions to innovate. The development of options requires determination of whether modification in tax policy can appreciably increase industrial innovation and will depend upon a careful consideration of what changes in economic policies and initiation and retargeting of Federal assistance programs might directly and positively promote innovation in different types of firms and industries. Special attention should be paid to developing options to offset the particular negative effects upon innovation which may result from other Federal policies (such as environmental, health, or safety regulations). Included in this issue/option area is an assessment of the specific benefits which might emerge from the focused use of loans; loan guarantees and subsidies; tax rates, deductions, credit, and depreciation schedules; and Federally provided (or supported) innovation risk insurance and equity financing. In assessing an option, there must be explicit recognition of any possible windfall benefits outside th target area; the effect of the option on Federal revenues; the difficulty of developing and administering eligibility criteria; and the extent to which the assistance merely may displace corporate funds that would otherwise have been invested in innovation.

Illustrative of the types of options which could emerge are: selective reductions of the capital gains tax to promote the establishment and growth of new, high technology enterprises (as discussed in the "Strategy Statement"); tax write-offs for corporate funding of university-based R&D to promote basic industrial R&D and to develop a closer interaction between universities and firms; provision of loan guarantees, linked to corporate initiative of RD&D programs, to facilitate rapid implementation of significant opportunities resulting from such programs; provision of regulatory risk insurance, coupled with the development of a regulatory agenda, to maintain government flexibility with regard to the establishment of environmental, health, and safety regulations without increasing the perceived risk associated with innovation-related investment decisions.

Issue/Option Areas

Brief Description

Organization Of
Domestic Policy Review
On Industrial Innovation
Industrial Innovation Coordinating Committee
Steering Committee
Integrating Staff
Task Force Executive Committee
Advisory Committees
Academia
Labor
Private Sector
Public Interest
Interagency Task Forces
Economic and Trade Policy
Environmental Health and Safety Regulations
Federal Procurement and Direct Support for Research and Development
Patents and Information Policy
Regulation of Industry Structure and Competition

recognized that different agencies may have different perspectives on both the issues at hand and on the desirability of specific options. When consensus cannot be reached, the different points of view will be indicated in the final papers.

The above principles are reflected in a straight forward work plan, the management of which is facilitated by organizing the review into five issue/option areas:

- o Economic and Trade Policy
- o Environmental, Health, and Safety Regulations
- o Federal Procurement and Direct Support for Research and Development
- o Patents and Information
- o Regulation of Industry Structure and Competition

The work plan of the DPR involves the following groups in the following tasks.

- o The Industrial Innovation Coordinating Committee, a Cabinet level task force chaired by the Secretary of Commerce provides overall policy guidance to the effort and is responsible for approving the final option papers for transmittal to the President.

- o The Steering Committee, a subgroup of the Coordinating Committee, oversees the progress of the study on a regular basis.

- o An Advisory Committee is being established in accordance with the provisions of the Federal Advisory Committee Act and is responsible for setting forth the views and recommendations of business, labor, public interest groups, and the academic community with regard to the five specific issue/option areas. The work of the advisory committee will be carried out by issue-specific subcommittees. An executive committee is responsible for integrating the work across the subcommittees. This work

Process Overview

The Domestic Policy Review of Industrial Innovation (DPR) will span a period of 10 months, will involve some 30 Federal departments and agencies, and will be assisted considerably by representatives of academia, labor, the private sector, and the public interest. The end product will be a strategy paper integrating the various options and a series of option papers. Together, they will help the President to focus on those aspects of industrial innovation which he believes most significant, and to structure the specific strategies which he believes most consistent with national needs. This draft work plan describes how this is to be done. The detailed approach is set forth in the appendices which follow. This approach has been developed with a view toward the principles and assumptions presented below:

- The subject of the DPR is industrial innovation -- the process of translating an idea into successfully commercialized new processes and products. While it is recognized that the general health of the economy and the overall profitability of firms affect the level and nature of innovation, the DPR will be confined to the development of policies and programs which focus specifically on the innovation process.

- The purpose of this DPR is to develop options designed to have a positive impact upon industrial innovation in the context of other national goals.

- The impacts of Federal programs and policies upon industrial innovation for the most part have been cumulative and unintended byproducts of programs and policies designed to achieve other ends. The DPR process must increase the awareness of Federal agencies as to the positive and negative impacts on industrial innovation that they produce. In the case of negative impacts, it must help them generate creative approaches to ameliorating the situation without compromising their primary mission goals.

- The impact of the Federal Government upon industrial innovation is indirect. Innovation takes place at the firm level. As a consequence, the options developed must reflect an understanding of firms' operations and of the specific incentives and disincentives which influence corporate decisions and abilities to innovate.

- If any changes in Federal policy are to result, recommendations must be based upon convincing and reliable information evidencing the specific impacts of existing

- An assessment of the impact of the option upon employment, inflation, and the balance of trade.

- An assessment of the impact of the option upon the rate and level of attainment of other national goals.

- A determination of the implementation requirements of each option and an assessment of implementation feasibility, including both organization, administrative, and political considerations.

Once these individual options are generated and characterized, those characterizations will be used by the DPR staff and the Domestic Policy staff to integrate the options into a series of goal-oriented strategies for the President's consideration.

- Industry classification

  The differential impact of government actions on various industries is easy to visualize. Options aimed at reducing the uncertainty of future environmental regulations, for example, will have a major impact on the chemical industry, a medium impact on textiles, and a lesser impact on the electronics industry. There are certainly other classifications but these are essential in evaluating options by target.

- Stage of Industry

  Options aimed at innovations which improve productivity and reduce cost would influence the decision-making process in industries at a later stage in the product life cycle (where price is a major competitive factor). They would have little influence on firms at the early stages (where product characteristics are the important determinant of competitive position). Such a distinction is particularly important when the goal is to increase exports or decrease imports strategically in an industrial area. Cost-reducing innovation may have little effect in one industry or segment whereas product innovation may have a major effect - e.g., the Japanese decision to invest in improvement of color television receivers rather than in cost reduction and their decision to invest in cost reduction of black and white receivers rather than in product improvement.

- Structure of Industry

  Direct government support of R&D is likely to promote innovation in disaggregated industries. In concentrated industries, the leading firms do a great deal of R&D, e.g., Bell Laboratories, and there is a strong indication that government funds merely displace corporate funds rather than increase the R&D effort. However, in disaggregated industries a major obstacle to R&D is the small amount of resources which any one firm is able to devote to such work. Another obstacle to innovation in disaggregated industries is that any generation of non-proprietary knowledge will be of equal benefit to competitors.

government support. This would benefit the large firms because they do the bulk of government R&D. An alternative proposal would place all such patents in the public domain. This not only would inhibit the use of such inventions and thus the innovation process, but would also benefit large firms. Large firms can secure a dominant market position through other means. Often they are required by the Department of Justice to share or freely license their patents. Thus, they are accustomed to operating without patent exclusivity. Small firms, on the other hand, well may need some commercial exclusivity in order to raise capital, enter a new marketc., etc.

Size, however, is not the only characteristic with which we will be concerned. If the Administration is to develop a coordinated strategy, rather than a series of unrelated recommendations, we will have to identify precisely the areas each option will affect. Initially, we have identified nine particular considerations grouped into three primary categories:

- Characteristics of the firm
- Characteristics of the industry
- Characteristics of industrial innovation

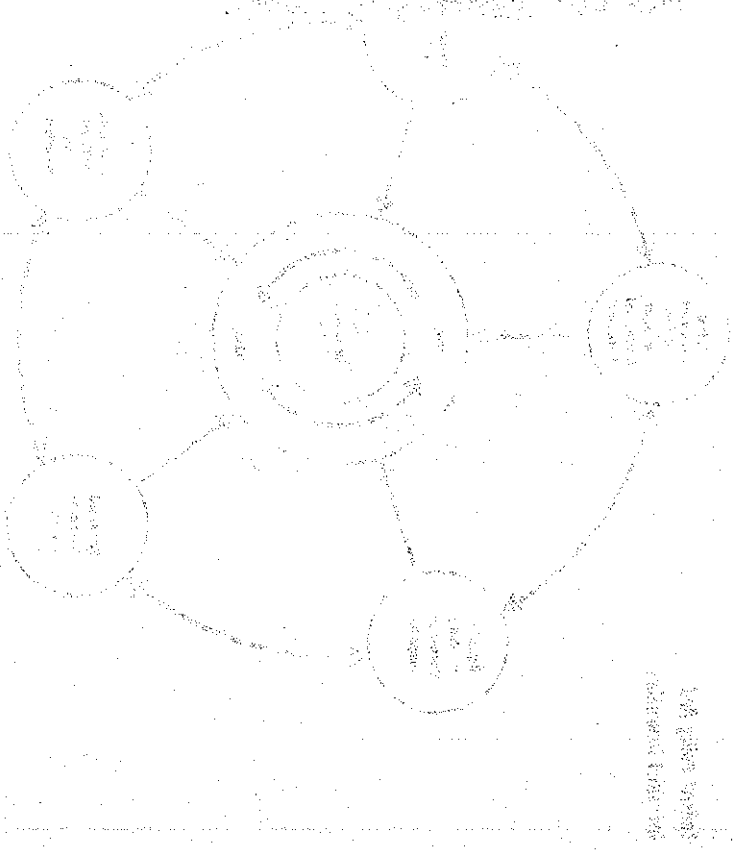
The particular characteristics of the firms which initially have been identified as being of concern in formulating and assessing focused options are:

- size of firm, ranging from start-up to large;
- degree of vertical integration of firm, ranging from non-integrated to highly integrated;
- span of target firms, ranging from local to multinational;
- market of target firms, ranging from local to foreign;

The particular characteristics of industries which have been initially identified as being of concern in formulating and assessing focused options are:

- industry classification;
- stage of industry, ranging from early to late in the product life cycle;
- structure of industry, ranging from disaggregated to concentrated.

STRATEGY STATEMENT



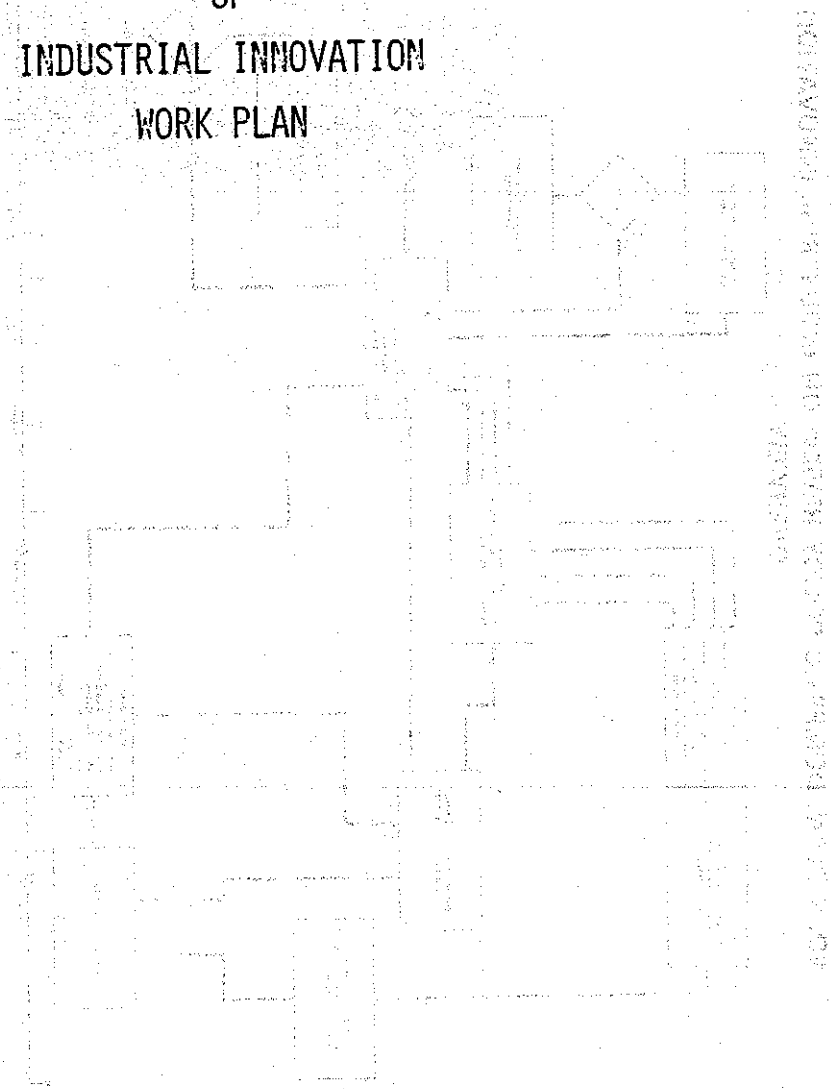
This Domestic Policy Review of Industrial Innovation is based upon a recognition that actions of the Federal Government can and have had significant impacts upon most firms' abilities and decisions to innovate. Through careful, systematic consideration and precise formulation of specific policies and programs, the Federal Government can influence the future rate and direction of industrial innovation in a way that will provide positive benefits to the economy and to society. Such opportunities can be found in the following Federal policy and program areas:

- Economic and Trade Policy
- Environmental, Health, and Safety Regulations
- Federal Procurement and Direct Support for Research and Development
- Patent and Information Policy
- Regulation of Industry Structure and Competition

In January, 1978, the Harris Survey reported that as they look ahead, the American people are convinced that the United States will depend for its greatness more on scientific research, industrial know-how and technological genius, and less on natural resources and hard work: 78 percent believe technological genius is key to future national greatness, and 80 percent believe that industrial know-how will also be crucial. The downturn in industrial innovation in the United States, the relatively slow rate of productivity growth in U.S. industry as compared with the rest of the world, and the tremendous commitment of foreign nations to industrial innovation serve to challenge this belief and to underscore the importance and the need for the timely completion of this DPR of Industrial Innovation.

Charts and Attachments:

DOMESTIC POLICY REVIEW
OF
INDUSTRIAL INNOVATION
WORK PLAN



SEPTEMBER 18, 1978

will be completed in November, 1978 at which time the Advisory Committee will expire.

o Federal Departments and Agencies will assess the impact of their existing programs and policies upon industrial innovation concurrently with the work of the advisory committee. They will develop positions regarding the feasibility and merit of adopting alternative approaches to the attainment of their mission objectives which have a more positive impact upon industrial innovation. This work will be completed in October 1978.

o Joint Seminars in each issue/option area will be held in November. Representatives of labor, academia, the private sector, the public interest, and the Exectutive Branch will participate. After the exchange of views, the position papers of the advisory committee and of the Federal agencies will form the starting point for the work of the interagency task forces.

o Interagency Task Forces, organized in the same areas as the advisory committee subcommittees, will be established. Each will focus upon its specific issue/option area and will be responsible for the definition of issues and the development and analysis of specific options. Each task force will be comprised of representatives of Federal agencies with particular interest in and responsibility for the issues of concern to that task force. The work of the task forces will be completed by March 15.

o The Task Force Executive Committee, an Assistant Secretary level committee comprised of the chairpersons of the interagency task forces will coordinate the work of the task forces and assure the integration of this effort. The Task Force Executive Committee will meet with the Steering Committee and with representatives of other agencies as appropriate.

o The Integrating Staff, under the direction of the Assistant Secretary of Commerce for Science and Technology, will be responsible for the day-to-day management of the entire effort and will serve as the primary staff responsible for integrating the work of the task forces on behalf of the Task Force Executive Committee. Other key agencies are urged to assign senior policy analysts to serve as members of this staff.

o The Steering Committee and Coordinating Committee will review the output of the task forces and, as noted, are responsible for recommending transmittal of the final option papers to the President no later than April 1, 1979.

programs and policies upon innovation, and indicating how particular changes in policies and programs will result in increased innovation. Therefore, this DPR process will offer the private sector the opportunity to illuminate the corporate decision-making process to specify particular recommendations which will induce greater innovation, to document the negative impact of specific Federal policies and programs upon innovation, and to demonstrate the benefits which will accrue to the firm and society from recommended changes.

The wide range of policies and programs under consideration, and the myriad of national goals which they affect, requires the DPR process afford representative of labor, the public interest, and the general public an opportunity to present their considered points of view on the issues along with their recommendations for action and their perspective on the recommendations of the private sector. Any recommendations must also be reflective of the state of research-based knowledge on industrial innovation. Experts from the academic community therefore, will participate in the process.

The variance in points of view among the private sector, labor, public interest, and government communities requires that the process afford an opportunity for interaction among the groups.

The DPR process is to result in an advisory document for the President. As a consequence, the DPR will proceed in two phases; a public information gathering phase, and an option development and assessment phase conducted privately within the Executive Branch.

The output of the DPR is to be a set of specific, carefully analyzed options which can be seen by the President as combining to form a set of strategies enabling the government to influence industrial innovation at a minimum cost to the government while pursuing other national goals. Each option therefore, will be analyzed to determine its likely beneficial impacts upon innovation at the firm and industrial sector level, its on- and off-budget costs, its effects on competition, and the feasibility of its implementation. In addition, it will require a careful integration of the work of multiple task forces to develop an understanding of the singular and combined impact of the various options upon both industrial innovation and other national goals.

The final option papers transmitted to the President need not be consensus documents. It is

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Congressional Affairs
Washington, D.C. 20230
(202) 377-3663

September 13, 1978

Honorable Gaylord Nelson
Chairman, Select Committee
on Small Business
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

The President has appointed Secretary Kreps as chairperson of a Cabinet-level Task Force on Industrial Innovation. It will develop, for Presidential review, recommendations for Federal action aimed at increasing industrial innovation in the United States.

Assistant Secretary for Science and Technology, Jordan Baruch, who is overseeing the day-to-day workings of this policy overview, will conduct a detailed briefing on the study September 18 at 10:30 a.m. in Room 235 of the Russell Senate Office Building.

Industrial innovation is integrally related to the rate of real economic growth, inflation, employment, and the balance of trade. We hope you and interested Members and staff of your Committee share our concern and will join us at the briefing.

Enclosed for your further information is an overview of our effort. Copies of the complete work plan will be available at the briefing.

Sincerely,

for Andrew E. Manatos
Assistant Secretary for
Congressional Affairs

Enclosure

cc: Honorable Lowell P. Weicker

MR. CHAIRMAN, I COULD GO ON FOR HOURS ABOUT MY FAVORITE SUBJECT, BUT THE STUDY'S RESULTS WILL SPEAK LOUDER THAN MY WORDS. WE ARE COMMITTED TO THE INDUSTRIAL DEVELOPMENT OF THE UNITED STATES AND RECOGNIZE THE CRITICAL ROLE THAT TECHNOLOGICAL INNOVATION AND THE SMALL-BUSINESS COMMUNITY PLAY IN THAT DEVELOPMENT. WE ARE ALSO COMMITTED TO EXPLORING HOW THE GOVERNMENT CAN INFLUENCE AND ENCOURAGE THAT DEVELOPMENT IN THE PUBLIC INTEREST.

MR. CHAIRMAN, THAT ENDS MY PREPARED TESTIMONY. I SHALL BE GLAD TO ANSWER ANY QUESTIONS THE COMMITTEES MAY HAVE.

IT ALSO WILL CONCERN ITSELF WITH THE INDIVIDUAL INVENTOR--FOR THAT IS WHERE MUCH OF INNOVATION STARTS--WHETHER THE INVENTOR IS AN EMPLOYEE OR WORKING ON HIS OWN.

THE INITIAL INPUT TO THE STUDY IS TO COME FROM THE PRIVATE SECTOR--FROM BUSINESS, LABOR, PUBLIC INTEREST GROUPS, AND ACADEMICS. THE BUSINESS PORTION WILL INVOLVE THE LEADERS OF SOME OF OUR MOST INNOVATIVE LARGE FIRMS; REPRESENTATIVES FROM LESS INNOVATIVE, MATURE INDUSTRIES; AND MEMBERS OF THE VENTURE CAPITAL INDUSTRY, SUCCESSFUL SMALL BUSINESS LEADERS, AND THOSE WHO ARE TRYING TO BECOME SUCCESSFUL LEADERS OF SMALL BUSINESSES. THEIR TASK IS NOT TO HAVE A MASS GRIPE SESSION ABOUT WHAT THEY THINK IS WRONG WITH GOVERNMENT. THEY HAVE THE SPECIFIC TASK OF FOCUSING POSITIVELY ON GOVERNMENT AND INNOVATION. SPECIFICALLY, THEY ARE BEING ASKED TO ANSWER THE QUESTION,

> "WHAT OPTIONS ARE OPEN TO THE FEDERAL GOVERNMENT THAT WILL ENCOURAGE INDUSTRIAL INNOVATION IN THE UNITED STATES AT MINIMUM COST TO SOCIETY AND WITHOUT SACRIFICING OTHER NATIONAL GOALS?"

WE ARE NOT LOOKING TO THEM FOR UNFOUNDED ADVICE OR FOR VAGUE GENERALITIES. WE ARE ASKING THEM TO BRING THE WEIGHT OF THEIR OWN EXPERIENCE TO THE PROBLEM, TO PRESENT DATA, RELATE ANECDOTAL EVIDENCE, DEMONSTRATE THEIR CONTENTIONS

IS CLEAR. THE MAJORITY OF DICTATING MACHINES IN THE OFFICES OF CONGRESS AND THE ADMINISTRATION COME FROM GERMANY OR JAPAN. NO HOME VIDEOTAPE RECORDERS ARE MADE IN THE U.S. FOREIGN MACHINE TOOLS, NUTS AND BOLTS, AND EVEN SKIS HAVE INVADED OUR MARKETS IN UNPRECENDENTED NUMBERS. THE NEW YORK TIMES RECENTLY REPORTED THAT OUR TRADE DEFICIT FROM THE IMPORTATION OF MACHINERY HAD EXCEEDED THAT FROM OIL.

WHETHER OR NOT ONE CAN PROVE STATISTICALLY THAT THERE HAS BEEN A DECLINE IN U.S. INNOVATION, THE NEED TO ENCOURAGE FURTHER INNOVATION IS CLEAR. ONE CAN DEMONSTRATE CONCLUSIVELY THAT THE RATE OF A COUNTRY'S INDUSTRIAL ADVANCEMENT IS INTIMATELY LINKED TO ITS RATE OF INDUSTRIAL TECHNOLOGICAL INNOVATION. THERE IS LITTLE DOUBT THAT OUR INDUSTRIAL DEVELOPMENT DESPERATELY NEEDS INVIGORATION, IF IT IS TO MEET THE DEMANDS OF OUR SOCIETY FOR BETTER GOODS AND SERVICES, IF IT IS TO GENERATE THE NATIONAL SURPLUS THAT ENABLES US TO CONTINUE OUR SOCIAL PROGRAMS AND REDEEM OUR ENVIRONMENT FROM THE EXCESSES OF THE PAST, AND IF IT IS TO GIVE US CONTROL OF OUR POSITION IN WORLD TRADE SO THAT WE CAN NEGOTIATE WITH OTHERS FROM A POSITION OF STRENGTH. THAT VIGOR CAN COME ONLY FROM AN ONGOING AGRESSIVE POLICY OF INNOVATION.

BECAUSE THAT POLICY IS IN THE PUBLIC INTEREST, BECAUSE INNOVATION TAKES PLACE ALMOST ENTIRELY WITHIN THE PRIVATE

WHILE THE RECORD OF LARGE INNOVATIVE FIRMS IS SUBSTANTIAL, THE RECORD FOR SMALL BUSINESSES BASED ON TECHNOLOGICAL INNOVATION--ESPECIALLY THOSE IN HIGH TECHNOLOGY AREAS--IS EVEN MORE IMPRESSIVE. IN THE SAME FIVE YEAR PERIOD, A SERIES OF SUCH SMALL BUSINESSES EXPERIENCED SALES GROWTHS OF 42.5%--ROUGHLY THREE TIMES AS GREAT AS THEIR LARGER COUNTERPARTS. THEIR EMPLOYMENT IN THAT PERIOD GREW BY 40.7%--ALMOST TEN TIMES THE RATE OF THE LARGE INNOVATIVE FIRMS, AND SOME 65 TIMES AS MUCH AS THE LARGE MATURE FIRMS! CLEARLY, THE SMALL FIRMS HAVE A SPECIAL ROLE IN SECURING FOR SOCIETY THE BENEFITS OF TECHNOLOGICAL INNOVATION. SOME STATISTICIANS RIGHTLY MAY SCOFF AT THE USE OF PERCENTAGES FOR COMPARISON, SO LET ME QUOTE SOME ABSOLUTE NUMBERS. DURING THOSE FIVE YEARS, SIX LARGE MATURE FIRMS HAVING COMBINED SALES OF $36 BILLION CREATED 25,000 NEW JOBS. AT THE SAME TIME ONLY FIVE YOUNG HIGH-TECHNOLOGY FIRMS WITH ONE-FORTIETH THEIR SALES--$875 MILLION--CREATED 35,000 NEW JOBS! FIVE LARGE INNOVATIVE FIRMS WITH SALES OF $21 BILLION CREATED 106,000 NEW JOBS.

NOW MUCH OF THIS RUNS CONTRARY TO THE CONVENTIONAL WISDOM WHICH HOLDS THAT INNOVATION, ESPECIALLY WHEN APPLIED TO THE PRODUCTION PROCESS, THROWS PEOPLE OUT OF WORK. UNFORTUNATELY, THAT MYTH LINGERS ALL TOO HARD IN OUR SOCIETY. SALTER, A BRITISH ECONOMIST ADDRESSED THIS

OF COURSE, NOT ALL INVENTIONS REQUIRE SUCH A DRAMATICALLY SWELLING BUDGET AS THEY MOVE TOWARD BECOMING INNOVATIONS. IT IS ALMOST ALWAYS THE CASE, HOWEVER, THAT INVENTION, LIKE GIVING BIRTH TO A CHILD, IS THE LEAST EXPENSIVE PART OF THE PROCESS: THE ENSUING EXPENSES INCURRED TO REACH MATURITY REALLY ESTABLISH THE SIZE OF THE BILL. THIS FACT IN NO WAY DEMEANS THE ROLE OF THE INVENTOR. NONE OF THE PROCESS CAN TAKE PLACE WITHOUT THE BASIC CONCEPT SPRINGING FROM A FERTILE HUMAN MIND. THE IMPORTANT POINT HERE IS THE CRITICAL ROLE OF THE BUSINESSMAN, ENTREPRENEUR, DECISION MAKER--WHATEVER TERM YOU PREFER--IN DEVELOPING AN INVENTION INTO AN INNOVATION.

INVESTING IN A POTENTIAL TECHNOLOGICAL INNOVATION IS SO DIFFERENT FROM INVESTING IN BONDS OR OTHER SECURITIES THAT THERE REALLY OUGHT TO BE A DIFFERENT WORD FOR IT. INDEED THE ONE THING MISSING IS SECURITY--SECURITY IN ANY FORM. CONSIDER WHAT MUST GO THROUGH SUCH AN INVESTOR'S MIND:

WILL THE INNOVATION WORK?
CAN WE MAKE IT IN COMMERCIAL QUANTITIES?
DOES THE MARKET REALLY WANT IT?
CAN WE PRICE IT LOW ENOUGH TO SELL?
WILL THE RETURNS PAY BACK THE DEVELOPMENT COSTS?

STATEMENT OF
JORDAN J. BARUCH
ASSISTANT SECRETARY FOR SCIENCE AND TECHNOLOGY
U.S. DEPARTMENT OF COMMERCE
ON INDUSTRIAL INNOVATION
BEFORE A JOINT HEARING OF THE
SENATE AND HOUSE COMMITTEES ON SMALL BUSINESS
AUGUST 9, 1978

MR. CHAIRMAN, MEMBERS OF THE SENATE AND HOUSE COMMITTEES, I AM MOST GRATEFUL FOR THE INVITATION TO TESTIFY BEFORE YOU TODAY. YOU ARE REVIEWING THE PROCESS OF INDUSTRIAL TECHNOLOGICAL INNOVATION, AND ESPECIALLY ITS RELATIONSHIP TO SMALL BUSINESS. BOTH ARE DEAR TO MY HEART. HAVING STARTED AS AN INVENTOR IN A SMALL BUSINESS, I HAVE HAD THE EXPERIENCE OF WATCHING THAT BUSINESS SUCCEED AND GROW, IN NO SMALL MEASURE HELPED BY THE FINANCIAL REWARDS FROM ITS INVENTIONS. BEFORE DISCUSSING TECHNOLOGICAL INNOVATION, HOWEVER, I WOULD LIKE TO TAKE A MOMENT TO DEFINE MY USE OF THE TERM.

> TECHNOLOGICAL INNOVATION IS THE APPLICATION OF THE INDUSTRIAL ARTS AND SCIENCES, ALONG WITH THE HUMAN INTELLECT, TO CHANGE THE WAY SOCIETY CREATES ITS GOODS AND SERVICES OR THE VERY NATURE OF THOSE GOODS AND SERVICES.

The specific hard data are hard to come by, but if you look around the Halls of Congress and at the administration, you will find that most of the dictating machines come from Germany or Japan. No home video tape recorders are currently made in the United States. Foreign machine tools, nuts and bolts, and even skis have invaded our markets in unprecedented numbers. The New York Times recently reported that our trade deficit from the importation of machinery had exceeded that from oil.

Whether or not one can prove statistically that there has been a decline in U.S. innovation, the need to encourage further innovation is clear.

One can demonstrate conclusively that the rate of a country's industrial advancement is intimately linked to its rate of industrial technological innovation.

There is little doubt that our industrial development desperately needs invigoration, if it is to meet the demands of our society for better goods and services, if it is to generate the national surplus that enables us to continue our social programs and redeem our environment from the excesses of the past, and if it is to give us control of our position in world trade so that we can negotiate with others from a position of strength.

That vigor can come only from an ongoing aggressive policy of innovation.

Because that policy is in the public interest, because innovation takes place almost entirely within the private sector, and because there is a clear national imperative for its attainment, we face a new opportunity for developing a rational set of Federal policies that will encourage effective technological innovation in the private sector.

Those policies involve almost every aspect of Government. Hence, developing them and integrating them into a consistent strategy is a complex and wide-ranging task. What will encourage innovation in small firms may only generate windfall profits for investors in large firms.

What will encourage innovation in high technology firms may have no impact on more mature ones. Policies that encourage innovation in response to domestic demand may have little impact on our international trade position.

Since the problem is so complex, President Carter has directed that the Secretary of Commerce conduct a wide-ranging interdepartmental study to develop the policy options—and their implications—that the administration can use to encourage industrial innovation in the national interest.

The Secretary has asked me, as the chief science and technology policy officer in the Department, to undertake, with her supervision, the design and conduct of that study.

The study will focus on what Federal options are available for encouraging innovation at the level of the individual firm—large or small, new or established.

It also will concern itself with the individual inventor—for that is where much of innovation starts—whether the inventor is an employee or working on his own.

Technological innovation is the application of the industrial arts and sciences, along with the human intellect, to change the way society creats its goods and services or to change the very nature of those goods and services.

I want to stress that until a new method, product, or service is actually used, until it diffuses throughout society, the innovation process has not been completed.

An invention, as opposed to an innovation, may be an intellectual tour de force, but it is only one part of the innovation process.

It is obvious then that business, small and large, has a major contribution to make to the innovation process.

I would like to concentrate for a moment on what this requires of business.

Let me use some statistics taken from the chemical industry. The basic laboratory project leading to an invention or to the proposal for a new product may cost around $50,000.

The scale-up stage to see if the laboratory results can be extended, costs around 10 times that, or $500,000.

The pilot plant, to test whether the product can be made in commerical quantities at the right price costs about 10 times that or $5 million.

Last, if all goes well, the final plant and distribution system frequently have a price tage 10 times greater still, or $50 million.

Of course, not all inventions require such a dramatically swelling budget as they move toward becoming innovations.

It is almost always the case, however, that invention, like giving birth to a child, is the least expensive part of the process. The ensuing expenses incurred to reach maturity really establish the size of the bill. This fact in no way demeans the role of the inventor. None of the process can take place without the basic one concept springing from a fertile human mind. The important point here is the critical role of the businessman, entrepreneur, decisionmaker—whatever term you prefer—in developing an invention into an innovation.

Let us consider the questions that go through the mind of such a person:

Will the invention work?
Can we make it in commercial quantities?
Does the market really want it?
Can we price it low enough to sell?
Will the returns pay back the development costs?
Will the returns pay back the costs of our last six losers?
Will the Government let us make it?
Will the Government let us sell it?
Can I get my money out?
And so on.

What we have to recognize is that the name of the innovation game is risk-taking. It is small wonder that there are so few players.

For those who have the skills to analyze the likely results, for those who have—or can muster—the resources to back their judgment, for those who have the stomach to play the game to the end, the rewards can be great.

For society they are greater still. In the years from 1969 to 1974, for example, a series of large innovative firms experienced sales growths

It is a total process, and we still need to know more about it.

I suggest perhaps schools of business are the ones that should assume some position of leadership.

Senator McIntyre. Dr. Morse, I would like to commend you for the help you have given the committee in this area, and to the Congress.

I want to assure you the Small Business Committee of the Senate, along with our counterpart, the Small Business Committee of the House of Representatives, has truly taken a leadership role in this area of trying to help the small business—in the tax area, in the area of capital formation, and now in this area of innovation.

In the tax area, we have been successful in reducing rates up to $50,000 back in 1975; and this year cutting up to $100,000, and maybe if we are lucky, $150,000.

Also, in 1976, we have reformed the estate tax for the first time since 1942, and, in 1977, our committee formulated the employment or jobs credit of $2,100 for new employees. Our capital formation in our hearings in February, 1978, addressed these matters and raised them to the level of public debate; and now we are conducting the first hearings about the President's 28 agency review of innovation. And, I assure you it is our intention to stay with the subject, and try to turn the situation around for small business.

Dr. Morse. Mr. Chairman, do you see any prospect of getting some action now either legislatively, or by executive order, rather than waiting for 1½ years, and if so, who will carry the ball?

Senator McIntyre. Well, Congress will carry the ball.

We do not have to wait on any committee.

Dr. Morse. Congress is a pretty nebulous animal. Someone has to do this. There is no one in Congress or the executive branch that speaks to this subject.

I cannot identify them, can you?

Senator McIntyre. No; not particularly.

Dr. Morse. We could change our procurement policy in many areas without new legislation.

Senator McIntyre. Senator Nelson has been outstanding since taking over this committee. The Small Business Committee was first a part of the Banking Committee. That was back in 1965 and 1966. At that time there was no staff attached to the Subcommittee on Small Business and Banking.

Now that subcommittee has been done away with, and this was due to the leadership of Senator Nelson in doing it. I actually opposed this move, for reasons we need not go into now.

The House Small Business Committee has a record of leadership.

But we have practical difficulties in this R. & D. field. If Edison appeared in the door today with an invention down at DOE, there is no way we can treat him properly. It seems that Government agencies have no way of dealing with one man.

If the man comes in with a Xerox, or with IBM, why they are accepted: "Come right in, what is on your mind, sir." So small business is handicapped in many ways, for instance, in the Armed Services Committee, I think we spend anywhere between $750 million and $850 million a year in what we call independent R. & D., not even a line item. And, it goes to the 50 or 65 largest industries and manufacturing houses in the field of arms and weapons.

The company installed this, and had 2 years operating experience in the Boston area. A direct comparison with the conventional home heater showed a saving of approximately 20 percent in fuel day in and day out for 2 years. There are few programs, if any, in DOE that look that good. The Department of Transportation asked the company to submit an unsolicited proposal 2 years ago but nothing has happened.

In the interim, Government funds have been used for in-house work, both in Oak Ridge and Brookhaven. No support is available for demonstration programs, and no progress has been made in terms of getting a product on the market, yet the work continues in-house in the Government laboratory.

Senator McIntyre. What evidence do you have that other experienced people share your views regarding that particular state of affairs in the high technology community?

Dr. Morse. I guess, first, because of my background and interest, I see a lot of people in the small business community.

I am a director of several high technology companies. More specifically, before coming down here, I thought it appropriate to recalibrate my own thinking. We have in the Boston area a relatively unstructured organization known as the High Technology Council. Membership includes most of the high technology companies in greater Boston. Dr. Stata, president of this organization, and analog devices wrote to all members for their comments on the present climate for technological innovation, and requested they send these to me. I can say without exception, such comments are in accordance with the views I have expressed.

Senator McIntyre. Has there been any change in the environment for the development of innovative technology in large corporations in the last decade?

Dr. Morse. Yes; I believe there has been. Some comments on that were brought out at the annual meeting of the National Academy of Engineering in which I participated.[5]

In a period of inflation, high interest rates and current depreciation rates, it is almost impossible for a capital intensive large company to maintain its dividend policy and replace and update facilities.

There is a shortage of cash that one might put into R. & D. work.

Additionally, I think it is well-established that the larger the company, the less easy it is to attract and hold innovative technical people. Companies are now by their very size highly structured and it is hard to deal with the innovation process. Current management technique in this country also now emphasize return on investment which often is inconsistent with risk-taking.

Our financial community views return on investment as an essential factor in appraising a company's operation, and there are many more opportunities where a large company can invest its capital and show 25 to 30 percent pretax earnings on noninnovative programs without R. & D. risks.

As a result of these problems, it is interesting to note that many of our more innovative large companies are trying to seek out mechanisms for promoting entrepreneurship, either by setting up centers of

[5] Innovators and Entrepreneurs—An Endangered Species; Annual Meeting, National Academy of Engineering, Washington, D.C. February 1978.

The spirit of entrepreneurship is still alive and healthy in the United States. Scientific and management talents are available. We have ample sources of potentially available venture capital. I suggest that it is up to the Congress of the United States to re-create a national environment so that in cooperation with Government, industry, and our academic community our small innovative high technology companies can flourish and new enterprises can be generated. With proper incentives for management, entrepreneurs, and inventors, we can again create great industries for the future. Only by such a procedure can we maintain a high level of employment, improve our quality of life, and reestablish our presently eroding position in the world markets.

Senator McIntyre. Thank you.

You were a member of the Charpie panel, were you not?

Dr. Morse. Yes, sir.

Senator McIntyre. And the Charpie panel, the subject was "Technological Innovation, Its Environment and Management."

Would you consider that a blue ribbon panel, Dr. Charpie was chairman?

Dr. Morse. Dr. Charpie has a broad background as a technical person. He is a professional who knows his business. He is now chief executive of the Cabot Corp. in Boston.

Senator McIntyre. The members of this panel certainly had an interesting background in innovation.

Dr. Morse. Yes; they did.

Senator McIntyre. What result did we get from this study?

Dr. Morse. Nothing. I cannot think of a single action, either executive or legislative, that has taken place as a result of that study.

Senator McIntyre. I notice on chart 13 in this report, it indicates some inventive contribution of independent inventors and small organizations in the 20th century, and I see power steering, vacuum tubes, rockets, streptomyacin, penicillin, what is a cottonpicker?

Well, are they small firms that developed those inventions?

Dr. Morse. They are not small firms now.

Senator McIntyre. No, but they were then.

Dr. Morse. The point of that study was to demonstrate, and I think there have been many examples since then, that innovative ideas tend to come from outside of big industry.

[The chart follows:]

Some Important Inventive Contributions of Independent Inventors and Small Organizations in the 20th Century

Xerography—Chester Carlson.
DDT—J. R. Geigy & Co.
Insulin—Frederick Banting.
Vacuum Tube—Lee De Forest.
Rockets—Robert Goddard.
Streptomycin—Selman Waksman.
Penicillin—Alexander Fleming.
Titanium—W. J. Kroll.
Shell Molding—Johannes Croning.
Cyclotron—Ernest O. Lawrence.
Cottonpicker—John and Mack Rust.
Shrink-proof knitted wear—Richard Walton.
Dacron polyester fiber "Terylene"—J. R. Whinfield/J. T. Dickson.
Catalytic cracking of petroleum—Eugene Houdry.

Since 1967, almost every action taken by both the executive and legislative branches of our Government has resulted in a further deterioration in the climate for technological innovation in the United States.

This country no longer has unique scientific and technical capabilities. We have a serious imbalance of payments. The business climate for an innovative high technology company as well as the incentives for both the investor and entrepreneur to create new technical enterprises have been drastically impaired.

Let me review some of the changes which have adversely affected the process of technological innovation in this country in recent years:

(A) TAXES

Because of the very substantial reduction in the gap between personal income tax and capital gains tax, financial incentives for both the investor and entrepreneur have now been greatly reduced.

(B) MANAGEMENT INCENTIVES

The elimination of the so-called employee qualified stock option removed the principal mechanism employed by small companies to both attract and hold key personnel and executives. Large corporations offer high salaries, permanence of employment, long vacations, and pensions. None of these features are available in the new technical enterprise and historically it was only through the use of qualified stock options with incentives for capital appreciation that first-class people could be induced to leave large companies for the tenuous rewards associated with a speculative business venture.

(C) GOVERNMENT R. & D. CONTRACTING

Historically, Government support for new technology, particularly by the Department of Defense, and later NASA, played a very important role in the early development of the high technology company complex in such areas as Palo Alto and so-called Route 128 in Greater Boston. As a result of the Mansfield amendment, and contracting policy, the unsolicited proposal system of R. & D. contract award is now nearly eliminated. We have a large aerospace and "in-house" Government laboratory complex against which a small organization must compete. We have no uniform patent policy or appropriate provision for protection of corporate background technology. A policy of demanding cost sharing by DOE and other Government agencies is totally inappropriate for a small company. The present bureaucracy of Government R. & D. contracting and associated costs and time for proposal writing, accounting, auditing are completely prohibitive for most smaller companies with limited resources.

(D) REGULATION

The cost of regulation has a serious impact upon our large corporations but for the samll companies it is prohibitive. In the past 10 years,

nize the need for substantial changes in our national environment if we are to reverse the current and extremely dangerous trends which have resulted in a loss of our once unique position as an innovative industrial society.

The Apollo space program which achieved a Moon landing represented a fantastic demonstration of this country's ability to mobilize its technological and management forces if a clear-out objective is delineated and funded as a national effort. From a political point of view, this activity may have been appropriate, but the manned space program, contrary to NASA publicity, has no economic justification in terms of its ability to generate commercially viable products. This and other much less costly efforts by the Federal Government to "force" technology into use have failed as most experienced technical executives would have predicted. There is no more costly activity in an industrial company than attempting to find a use for a new piece of technology as compared with the more effective technique of utilizing or developing technology to meet a market need. The whole "solid state" revolution in electronics resulted because the superb management, scientific and technical talents of the Bell Laboratories recognized a need for better and faster switching devices and a more reliable replacement for the vacuum tube.

The country now has a fully entrenched complex of aerospace industries and Federal contract research organizations that know no business other than dealing with the Federal Government. There is a great deal of talent in most of these organizations and they represent a valuable national resource particularly to meet unique military and aerospace needs. This complex generally has little experience in the competitive industrial business environment and should not compete with innovative industrial enterprises with the ability and incentives to develop commercial products.

The so-called "technology transfer" process is in essence a people transfer process. The generation of technical reports and studies in the absence of an entrepreneur, or a busniess entity familiar with market requirements, has very little impact upon getting new technology effectively used. Our Department of Energy has a very unique opportunity, and management problem, in the sense that this is the first Federal department created solely for the purpose of "commercializing" results of R. & D. activities, and demonstration programs. Because of the current bureaucracy which has developed within DOE, and other agencies and departments and the increasing role of its in-house laboratories both in the conduct and management of research, many small innovative high technology companies now find it impossible to deal with Government agencies. The cost and time of proposal writing is now staggering for a small company. The Department of Energy has now initiated a policy of cost sharing for R. & D. contracts which is totally inappropriate for small companies.

A small firm with some very innovative scientists, for example, has for several years been working on novel advanced storage batteries. Conventional automotive batteries are produced by a relatively non-innovative industry and our national needs for both off-peak electric utility power storage and the successful introduction of an electric

mandating, and set-aside of funds that will go to small business in addition to investment of R. & D. across the board?

Dr. PRESS. Let me say that we are still the world's most advanced scientific and technological nation. However, those who follow the path of knowledge and innovation are concerned about trends—the trends I have cited, and some of the trends you have cited. The trends tend to indicate—we do not have the proof yet, and that is one of the reasons we are embarking on this study that innovation and support of technology are down in this country compared to countries like Japan, Germany, France, and Canada.

These countries are providing incentives of different kinds to foster innovation. The incentives, for example, include tax writeoffs of R. & D. subsidies for innovation, and perhaps support for small companies.

Part of our study will be to analyze precisely the programs of other countries to see whether there are any ideas that we can adopt, or whether anything is happening in foreign countries that will make our products less competitive. The issues that you raise will be part of our review. And since R. & D. support is also part of our review, we will also analyze the concern that you expressed about the proper share of Federal R. & D. funds for small companies in this country. I am not prepared now to recommend set-asides, or anything like that since it is premature. I would like first to see the results of analysis.

Representative BRECKINRIDGE. I want to certainly thank Dr. Press for his rejoinder, and I will close with a statement for the record, that he might address himself to later.

I notice he excluded the Soviets in his enumeration of the leadership in research and development.

A recent volume published by John Collins, a senior analyst, makes the point that where we used to rely on technological supremacy to offset numerical deficiencies that exist, the trend is going against the United States in that area; that we no longer can rely on that technological edge, and that that imbalance is one that is also overtaking us; and, that the Soviets are in fact producing qualitatively as well as quantitatively, weapons systems or weapons, that are equal or increasingly equal if not superior to ours. I would like to see you also address that in your study.

I say that as a member of the Armed Services Committee as well as a member of the House Small Business Committee.

Thank you.

Senator MCINTYRE. Before we let you go, Dr. Press, I would like to point out something you already know. In addition to the three studies, such as the Charpie study, the Mansfield study, and the OMB study, which are referred to in the letter of August 7, there are other studies that probably should be added to that orientation package for the Kreps panel.

One is Dr. Morse's study at MIT in 1976, and another is the American Electronic study presented to this committee on February 8, 1978.[1]

Thank you very much for your presence here this morning and very helpful testimony.

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[1] These two studies are also contained as Appendixes to the hearings. See Table of Contents for listing.

I would say the Office of Management and Budget, if your office is not able to do it, could do it very simply through the investment breakout of the U.S. people leading R. & D. by agency, and I would just put them on the mailing list and ask them what they are doing, and what they intend to do to insure a more equitable distribution of those funds, if you think that is the answer. I would like to know why. Mr. Chairman, I ask we keep the record open at this point for that purpose.

Senator McIntyre. Without objection, so ordered.

[The answer follows:]

I will inform the members of the Federal Coordinating Council on Science, Engineering and Technology, a sub-cabinet group of agency officials responsible for science and technology issues, of the committee's concern about the percentage of Federally supported research and development that is performed by small business. I will ask the members to examine and explain their agency's allocation of research and development funds, and to describe any current efforts to increase the funding of research to be performed by small business. As I indicated in my testimony, I will keep the committees informed of the results of my enquiry.

Representative Breckinridge. Thank you.

Representative Bedell.

Representative Bedell. Thank you, Senator.

Doctor, you said there will be a cabinet study undertaken.

Do you mean you will be on that study?

Will you tell us a little more about who at the cabinet level will be involved in this study?

Dr. Press. This is a study that will be undertaken under the domestic policy review process of this administration.

This is a process whereby cabinet-level studies are commissioned by the President, and approved by him. In the case of the study on industrial innovation, the chairperson is the Secretary of Commerce.

There are some 28 departments and agencies which will participate in the study. The steering committee consists of Commerce, Treasury, my office, the Council of Economic Advisers, the Defense Department, and OMB. We expect the study will be completed by April of next year. However, portions of it may be completed earlier.

I do not want to spend too much time on this, because Secretary Baruch, who follows me, will give you the details.

Representative Bedell. If you were a small businessman, would you have a lot of confidence that a study in which the top group consisted of the Secretary of Commerce, Secretary of Treasury, Charles Schultz, and Defense would be quite interested in small business?

Dr. Press. I think a small businessman would be pleased if he saw the way we have defined the issues.

He would see that the issue is receiving the highest level of attention it has ever gotten in any administration. He would also see we will address the issues that concern him: Tax policy, regulatory policy, procurement policy, patent policy, the policies followed by foreign governments as they affect our ability to export our products, institutional problems in industry as they affect both small business and large business. Any small businessman who sees the issues that we will address, would, I think, be very happy with the study.

Representative Bedell. Doctor, your past experience with those departments is different from mine, or else we just do not see the same,

private-sector people who will participate on task forces that parallel the Government task forces. They will prepare materials for us from their point of view. I am not sure of the representation precisely—I do not know the numbers of small businessmen on those task forces—but again, you can inquire of Assistant Secretary Baruch who is organizing this, and in charge of the daily operations.

Senator McIntyre. You are aware, as you have already stated, of the OMB study, that we are releasing to the public today, are you not, Doctor? The 1977 study of the Office of Management and Budget on research and development and the role of small business?

Dr. Press. I would have to see it to be sure I know what you are referring to.

Senator McIntyre. There are 10 recommendations in it, of this ad hoc agency panel, that drive directly in the direction I am sure you and the panel put together under Secretary Kreps should go. But, if you are not familiar with it, why, I will tell you how we handle it.

I will simply ask for the record, will you address the question of the usefulness of the recommendations of this study? Do you think this will be a beacon to guide your path?

Dr. Press. Can I respond in writing to that question?

Senator McIntyre. Yes. You can answer that question for the record.

[The answer follows:]

During the course of the study, we will be examining the ways in which, for example, the procurement system and Federal support of R&D could be adjusted so as to encourage greater innovative activity by the private sector. We will, of course, bear in mind the important role of small business in the innovation process and the recommendation of the ad hoc interagency panel will provide a helpful input in our effort.

Senator McIntyre. I will be glad to yield to Mr. Breckinridge, representing the Small Business Committee of the House of Representatives.

Representative Breckinridge. Thank you very much, Senator. I want to apologize for running a few minutes late.

Dr. Press, I am delighted to be with you, sir, and I want to join the Senator's line of interrogation concerning the representation of small business interests.

I was a little surprised, and then I must confess, I was not surprised, to find this sort of language in a Business Week article under the heading of research; the article outlines briefly the information you have described concerning the President's task force; then it concludes with a description, in this language, of the Small Business Administration.

Now, I think that is a clear statement of one of the problems that exists in Washington, with reference to perhaps the geratest resource that is available to us—that is small business—and I am concerned, if I might say so, about the nature of your remarks and your responsibility in this area.

I would hope that you would not personally rely on the Small Business Administration, not because I do not have the greatest confidence in my friend, Vernon Weaver, but, because I think you are the person that ought to be oriented to and perhaps comprehend much better than the administrative personnel over there. Such matters as jobs.

more innovative work. Some economic studies have identified regulatory impacts as a major restraint on economic growth.

(3) Equipment and facilities are aging and not being replaced as rapidly as necessary to keep U.S. industries productive and competitive. In some industries the level of technology used in production lags behind that in other countries. The steel industry is an example of an industry that has not kept pace with its international competitors.

There may also be some particular problems that plague small businesses. For example, the data suggest that small firms are encountering difficulties in entering the public markets to obtain venture capital. The number of public issues of common stock by small new companies has declined from nearly 650 in 1969 to 1 in the first half of 1975. The issues for small companies engaged in technologically intensive activities declined from 204 to 0. With a shortage of capital, the small companies never get started, or they die young, or they are absorbed by larger companies. In light of the important role of small companies in the innovation process, this data may portend future problems: A future Xerox or Polaroid may never get off the starting blocks.

Because of the importance of innovation to many of our national problems and because of these recent troubling observations, the President has directed that a Cabinet-level study be undertaken of the innovation issue. Unfortunately, the nurturing of innovation has often in the past been an almost incidental consideration in the development of the myriad of Federal policies—tax, procurement, regulatory, economic, foreign—that impact upon it. The objetcive of our study will be the development of Presidential-level policy options to remove some of the obstacles that are impeding increased innovative activity by the private sector. The study will be chaired by Secretary Kreps of the Department of Commerce; and Dr. Jordan Baruch, the Assistant Secretary for Science and Technology, has been designated the primary responsibility for directing the operation of the study. He is testifying in a moment so I will leave the detailed discussion of the study to him.

In closing, I merely want to emphasize again the importance of the issue and to report my pleasure that you share some of our concerns. Certainly, the role and problems of small enterprises will be very much on our minds as the innovation study proceeds.

Mr. Chairman, this concludes my testimony. I will be glad to respond to your questions.

Senator McIntyre. Thank you very much, Dr. Press.

What part are you going to play in these studies?

Dr. Press. In all of these domestic policy reviews, the White House staff is involved from the very beginning in defining the study, in selecting the participants, and in bringing the issue to the President's attention and securing his approval for the study. Then the studies are turned over to the cognizant departments in the Government—28 of them in the case of the innovation study—who will follow the progress of each of the task forces very closely. In the final stage, in preparation of policy recommendations for the President, we will then again get deeply involved.

I personally am on the steering committee for this study, a group of four or five individuals, who will follow this and see that it is progressing satisfactorily.

Senator McIntyre. Our first witness this morning is Dr. Frank Press, Director of the Office of Science and Technology Policy, the White House.

I am very happy to welcome you here this morning, Dr. Press.

We are delighted to have your testimony at this time.

STATEMENT OF DR. FRANK PRESS, DIRECTOR OF THE OFFICE OF SCIENCE AND TECHNOLOGY POLICY, THE WHITE HOUSE

Dr. Press. Thank you, Mr. Chairman.

Mr. Chairman and members of the committees, I appreciate the opportunity to appear before you to discuss innovation and the role of small enterprises in providing it. The issue is a very important one from the point of view of the Nation's economic health. I am most pleased that you share the interest of the administration in the level and direction of innovation in the country.

Studies by numerous experts have provided persuasive evidence that innovation is a major factor in this country's long-term economic growth. Edward Denison of the Brookings Institution, in his studies of the causes of economic growth and productivity in the United States, finds that the factor "advances in knowledge" has been the biggest single source of growth over the past several decades. Denison estimates that the factor accounted for nearly one-third of the growth in the Nation's output in the period from 1929 to 1969. Studies by others of particular industries or of particular innovations have also shown the large returns from investments in innovation. Perhaps more significant, these studies show even more substantive returns to society as a whole. In fact, the studies may even understate the contribution of technical change to social welfare because qualitative improvements in goods resulting from innovation may not be fully reflected in the usual economic indicators. Although some may debate the specific percentages, it is clear that innovation has been a major factor in maintaining this country's economic development.

The public also has developed an awareness of the importance of industrial innovation in maintaining the Nation's strength. In a Harris survey on "Factors in Making America Great," a nationwide poll, the public was asked to rate those factors responsible for the country's success in the past and those which would be effective over the next 25 years. The results showed scientific research, industrial know-how, and technological genius—in that order—moving into the top three places as factors that would most favorably affect our future. It is interesting to note that all three moved ahead of abundant natural resources and the work ethic, which rated No. 1 and 3 as responsible for our past success.

Innovation is also intimately connected to our efforts to improve productivity, to control inflation, to expand employment, and to increase our exports. A recent study by Data Resources, Inc., for instance, compares the contributions in these efforts of low technology industries with that of high technology industries, which presumably are more attuned to promoting innovation, over the period 1950 to 1974. The comparison is revealing:

> The output of high technology companies grew almost three times as fast as that of the low technology companies and their productivity rose twice as fast;

> and 1974, while output grew almost three times as fast. Prices, by contrast, rose for high technology products at only a sixth of the rate for low technology ones.

In an analysis conducted for the Senate Small Business Committee, the American Electronics Association found that these small, innovative companies registered a growth rate in employment of 23.7% compared to the older, larger companies' rate of 3.2% for the five years under study.

I will conclude this brief overview of studies of small business and innovation with the previously unpublished 1977 findings of the Office of Management and Budget. I quote:

> small firms have compiled a striking record of innovation in the private sector:
>
> (1) Firms with less than 1,000 employees accounted for almost 1/2 of the major U. S. innovations during 1953-1973
>
> (2) The ratio of innovations to sales is about 1/3 greater in firms with less than 1,000 employees than in firms of over 1,000 employees
>
> (3) Firms of less than 1,000 employees have a ratio of innovations to R&D employment which is approximately four times greater compared to firms with more than 1,000 employees
>
> (4) The cost per R&D scientist and engineer is almost twice as great in firms of over 1,000 employees than in firms with less than 1,000 employees

Given this well-documented, indeed over-documented and undeniably impressive account of small business's achievements in job creation, cost efficiency, and, most importantly, in innovation and development, why is it that small business continues to lag behind big business in research and development expenditures by the federal government, as the Office of Management and Budget has found? This fact flies in the face of

commensurate with its indisputed record as the primary source of innovations in our economy; and, we know what measures would solve this problem. But we are obviously making little progress in that direction. I am particularly disturbed by the fact that the Office of Management and Budget assembled a blue ribbon panel of experts from various government agencies to study this problem and, after analyzing it for a year and developing outstanding recommendations for its solution, it evidently has "slipped through the cracks" over at the OMB. I look forward to hearing from the OMB and to learning what they propose to do to get this problem and its recommended solutions out of the cracks and back on the road to implementation.

Before I summarize the studies that have been generated by this problem and have attacked it, let me first say that I think that we have studied it to death, so to speak; we need action now.

In 1966, a blue ribbon panel, commissioned by the Dept. of Commerce to study the contributions of small business to the development of science and technology, concluded that small business is responsible for over one half of the scientific and technological innovations that have taken place in this century. This conclusion was a matter of common knowledge in the scientific community itself, where small business has always been regarded as a critical component of the vanguard of progress and innovation.

Since that time, numerous studies and panels have arrived at the same conclusion: small business is necessary--vital--to the creative, innovative process that lies at the heart of scientific and technological advancement.

HOUSE SMALL BUSINESS COMMITTEE
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JOINT HEARINGS

ON

SCIENCE, TECHNOLOGY AND SMALL BUSINESS

OF THE

SENATE SMALL BUSINESS COMMITTEE,

THE SUBCOMMITTEE ON ENERGY, ENVIRONMENT, SAFETY AND RESEARCH

AND

THE SUBCOMMITTEE ON ANTITRUST, CONSUMERS AND EMPLOYMENT

* * *

OPENING STATEMENT OF

JOHN B. BRECKINRIDGE, CHAIRMAN

SUBCOMMITTEE ON ANTITRUST, CONSUMERS AND EMPLOYMENT

* * *

WEDNESDAY, AUGUST 9TH

9:30 a.m.

RUSSELL SENATE OFFICE BUILDING

new, small companies backed by venture capital professionals have given the United States worldwide leadership in the multibillion dollar microelectronics field. These applications are still in their infancy, with such areas as automotive electronics, telecommunications, and intelligent terminals for data processing promising to be billion dollar industries on their own.

We can multiply these benefits in many industries if we have the skill to encourage the ideas of small enterprises and help them develop into the marketplace.

The President has realized this in ordering the 28-agency review for the purpose of improving Government policies to encourage innovation.

The Small Business Committee wishes to support this effort in every way possible.

For years, we have been pointing to a series of studies showing that small business accounts for more than one-half of all inventions and innovations.

Several of these major studies were described in the earlier announcement of these hearings. Of special interest is the report of the Office of Management and Budget of March 10, 1977, which informed the President that "small firms have compiled a striking record of innovation."

This report concluded that "small firms are inadequately used" in the Federal Government's acquisition of $26 billion worth of research and development and that "our country will lose significant high technology capabilities (in the absence of) a concerted effort to increase small business R. & D. awards * * *"

In 1977, the OMB report had 10 specific recommendations for accomplishing this, and we shall want to explore in detail what Government agencies can do to implement these immediately.

We are releasing this study to the public this morning, and will take this opportunity to place in the record the announcement of the hearings and the several studies described herein, for the information of all concerned.

The importance of this subject is reflected in the interest of both the House and the Senate Small Business Committees. We are planning to monitor periodically this national effort.

We hope these initial hearings will contribute to even more impressive contributions by small business to innovation and national strength, both over the short-term and also long-range through the Presidential review.

[The announcement of the hearing heretofore referred to follows; the studies are included in their entirety as appendixes—see table of contents for listing.]

[From the Congressional Record, Aug. 4, 1978, pp. S12655–S12656]

NOTICE OF HEARINGS

SELECT COMMITTEE ON SMALL BUSINESS

Mr. NELSON. Mr. President, I wish to announce that the Select Committee on Small Business will conduct public hearings jointly with two subcommittees of the House Small Business Committee on the underutilization of small business in the Nation's efforts to encourage industrial innovation.

APPENDIXES

SELECT COMMITTEE ON SMALL BUSINESS

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