Comment of the Public Interest Subcommittee on the Industry Report on Research and Development

The Industry Subcommittee identified the university, small venture businesses, and trade associations as the most productive areas in which to focus increased governmental support of research and development. The Public Interest Subcommittee supports this emphasis, but with some very important reservations and modifications.

UNIVERSITY-INDUSTRY RELATIONS

We would agree that it is the role of the Government to foster basic research or generic research—research of the type unlikely to be sponsored by industry because its applications are uncertain or too far into the future, and/or its applicability transcends a single company or industry. We would also agree that the university is a logical and fruitful place for Government to concentrate its efforts in this area, although there also could be a role for other nonprofit institutions and government laboratories. We would agree that some of this research should be focused on "industrial needs of the future." But we would reiterate that if public monies are to be spent, or revenues foregone, there must be a mechanism through which potential benefits to society from the direction of the research can be considered. Perhaps broad guidelines of the type of projects eligible for matching funds would be sufficient and could avoid project by project scrutiny.

Another caveat is the degree of industry control over the university projects, and the corollary, the question of the independence of the university. The Public Interest Subcommittee is concerned about the possibility of misuse of such a scheme. Safeguards, including public scrutiny, would have to be devised to prevent such readily available funding from being used for product development rather than basic research.

SMALL VENTURE BUSINESSES

The Industry Subcommittee recommended preferential incentives to small business that would restimulate its traditional inclination toward innovation. The Public Interest Subcommittee supports this theme, which is treated at length in its own report.

SUPPORT OF R. & D. ON GENERIC TECHNOLOGY

The Industry Subcommittee has recommended that "direct Federal support, together with industry, of research, development, and dissemination to the U.S. industry of new technology, generic to process or product innovation in wide spectra of industries, should be strengthened and recognized as Federal policy." They make a variety of recommendations for "Cooperative Technology Centers" which would implement this recommendation.

While the Public Interest Subcommittee sees no problem in the principle of such a program, the example of computer integrated manufacturing, which was suggested as a good initial area of activity, highlights the problem of the desired *direction* of innovation.

The Public Interest Subcommittee would point to the increasing reliance on highly centralized, heavily capital intensive industries as a major problem in our society and our economy today. We see the trend toward increasing concentration and capital-intensivity as a major contributor to unemployment, energy waste, environmental damage, work dissatisfaction, and perhaps even alienation from social and political institutions. The direction for innovation highlighted by the industry report—"computer optimized production planning, computer optimized production control, computer automated manufacturing equipment and systems, computer controlled in-process inspection and quality assurance, computer automated assembly and robotics"—would give us more of the same type of production, and perhaps more of the same type of problem.

The Public Interest Subcommittee would instead use public funds to encourage innovation along the lines of "appropriate technology." If we, the public, are to fund "Cooperative Technology Centers," they could be encouraging decentralized economic activities which are more comprehensible to workers and which exist more harmoniously within communities. Such centers could be encouraging enterprises that create employment without the necessity of huge and unavailable capital expenditures for each workplace. And such centers should be encouraging enterprises which can produce without damaging the environment around them.

The report of the Public Interest Subcommittee points out that appropriate technology could be the cutting edge of innovation, the means by which we and our children will live in a resource-constrained society. Right now, there is tremendous need for quality control and for dissemination of information—roles which could be fulfilled by "Cooperative Technology Centers" if they were so directed. An excellent study by the

National Science Foundation [1] notes a crucial need for the buildup of a repertory of techniques in appropriate technology which are documented and made accessible to local groups so that they can evaluate relative merits before they act. The study also notes the necessity for extension services and community organizations which can bring the benefits within the reach of local innovative groups, and advocates a role for the Federal Government in the general areas of "pilot projects and incentive structures which foster the transfer of information and skills; the exploration and assessment of alternative policy options; and specific research programs, ranging from basic concept development to analysis and evaluation of new techniques."

The Public Interest Subcommittee supports the NSF recommendations. We would urge this type of support for appropriate technology as a basic direction of Federal support for R. & D. We would emphasize that we do not consider it an exclusive approach, or one that is suitable for all industries. But we think it appropriate that public monies should be spent to provide a catalyst for the exploration and support of a truly innovative system of production, one which very well may prove to be the answer to some of the most persistent problems in our economy and society.

SPENDING FOR DEFENSE R. & D.

The Public Interest Subcommittee is concerned that what we would consider the most important topic for consideration under the heading of direct Federal support for research and development does not appear in the industry report at all. That topic is the proportion of Federal R. & D. spending which is devoted to defense.

[1] "Appropriate Technology in the United States—An Exploratory Study" National Science Foundation, Research Applied to National Needs, 1977.

Spending on research and development for national defense and the space program accounts for more than 60 percent of total Federal spending on research and development. In 1976, $13.5 billion was devoted to defense and space R. & D. In an era of scarce government funds, such allocations directly detract from the support available for developing the foundations for innovations in social priority areas. And the high level of support for defense R. & D. may discourage creative resources—technical skills and capital—from being employed on innovations which could improve industrial productivity.

We think the division of Federal R. & D. expenditures between defense-related activities on the one hand, and civilian or social purposes on the other, is an issue which should be specifically addressed in this domestic policy review. Such a review should include an assessment of the effect of defense R. & D. on personnel available for civil sector R. & D. and on the costs of civil sector R. & D.

To summarize, any expenditure of public funds for direct support of research and development must be made within the context of not only improving the rate of innovation, but of concern for the direction of innovation as well. Within the caveat of that concern, the Public Interest Subcommittee supports the recommendations of the Industry Subcommittee for increased support of research and development in universities, in small venture businesses, and through generic technology development in "Cooperative Technology Centers." Any review of government policy on direct support of research and development should also include as assessment of the magnitude and role of government spending for defense R. & D. relative to its spending on R. & D. to promote nondefense goals and missions.

INDUSTRIAL ADVISORY SUBCOMMITTEE REPORT ON FEDERAL PROCUREMENT POLICY

industrial innovation

ADVISORY COMMITTEE ON INDUSTRIAL INNOVATION

Advisory Subcommittee on Procurement and Direct Support of Research and Development

Federal Procurement Policy

Final report of the Advisory Subcommittee on Procurement and Direct Support of Research and Development of the Advisory Committee on Industrial Innovation established as part of the Domestic Policy Review.

January 26, 1979

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I. EXECUTIVE SUMMARY AND RECOMMENDATIONS

For many years, the United States invested heavily in research and development and held an undisputed first place in global technological achievements. Recently, however, the country's investments in, and rewards from, technological innovation have faltered, while the pace of research and development (R. & D.) abroad has increased. Today, American public and private enterprise combined is funding research, development, and innovative application at a slower rate than in past decades. Excessive taxes on capital gains and a maze of regulatory uncertainties have reduced entrepreneurial incentives; organized political opposition to technological change is further discouraging innovation.

The long-term consequences of U.S. technical stagnation include lower productivity, higher costs, inflation, unemployment, a plummeting dollar, balance of payment problems, energy and material shortages, and a reduced standard of living that falls hardest on the poor and the disadvantaged. Loss of U.S. technical preeminence would require drastic change in American defense strategy, and expose the Nation to technical surprise. Examples of past technical surprises include the impact of "Sputnik" on the United States, the solid state watch on the Swiss watchmakers, and code breaking on Japan's World War II campaigns. Decisive government leadership is required to encourage innovation and reverse these trends.

Because it has such great power over industry, the Federal Government can stimulate investment in innovation. Improved procurement practices, stronger support of government and industrial research and development, tax reform that stimulates entrepreneurial capital investment, and reductions in regulatory uncertainties could be its tools. The purpose of the Subcommittee was to examine what can be done and to recommend modifications or changes in policies and practices that will stimulate innovation.

The Committee was broad in scope because that is the basic nature of government procurement. It was charged with examining procurement policies and practices across the entire range, from multibillion dollar major systems procurement by the Department of Defense to General Services Administration (GSA) purchases costing a few cents and from the viewpoints of both large and small business.

Innovation, as the committee defined it, is a complete process—from idea generation through research and development to production and introduction to the marketplace. The committee's conclusions are based on some fundamentals of innovation:

- The process of innovation begins with a new idea generated by a single individual. Any regulations or incentives should recognize that the creative individuals within industry should be encouraged to work in an environment conducive to creation.
- Innovation cannot be recognized fully until the idea that starts an activity has been tested. It is rare than an important innovation can have a major impact short of 4 or 5 years, and, more

frequently, the impact of a major innovation may not be felt for a decade or two.

- What must be created is an environment in which an idea can be heard and evaluated and at the same time provides some promise that the resources, be it money, facilities, or talented help, exists to bring the idea to fruition.
- Essential to the creative environment which encourages innovation is reasonable assurance that a good idea or a new approach to a problem will be recognized and bring a reward to the individual who had the idea. The reward may come in many forms—public recognition, peer recognition, money, freedom to create again, and profit.
- Any innovation, because it is something that has not been done before, brings with it at least some risk that it will not be successful. Innovative investment implies that risk taking is acceptable.
- As the innovation is developed, further innovation will be required in order to accommodate to each new concept and bring it into practical everyday use.
- One of the major hurdles which any innovation must surmount is peer evaluation. It is essential that the evaluation not be premature, and that the participants in the evaluation process be selected with care to prevent high infant mortality.

Using this concept of innovation, the committee's recommendations were made in a step-by-step process.

First, the barriers to innovation were examined and categorized from the viewpoint of all business, both large and small. The Committee looked at capital formation, restrictions on R. & D., tax disincentives, procedures used by other governments, inhibiting accounting procedures, common use products and GSA purchasing practices.

Second, the committee examined the government's current excellent progress toward reforming procurement particularly in large systems procurement under OMB Circular A-109. It looked to see if there were additional steps the Government could take that would be fruitful in stimulating innovation.

A subject of great concern was company sponsored R. & D., or as the Department of Defense (DOD) categorizes it, independent R. & D. not under government contracts. The committee examined the areas where R. & D. could be sponsored and tried to discover why R. & D. is becoming less effective—and what should be done to again stimulate free and enthusiastic I. R. & D.

A continuing problem recognized by the committee was protection of the rights of a private company to their proprietary data and their patented data. The corollary problem it addressed is what rights should a private company have to data and patents developed using government funds. The committee addressed this very complex problem from the viewpoint of procurement policy, and it concurred with the recommendations of another subcommittee which was primarily concerned with the problem.

Next the Committee examined in some detail how to increase basic R. & D. in universities, government laboratories, and industrial facilities. Basic research is the life blood of new technology and, while this was also the subject of another subcommittee, the problem was again reviewed by this Committee from the perspective of procurement policy.

Finally, the Committee examined ways of stimulating and creating new markets for innovation through the use of procurement policy and practices. Government procurement can and should be used creatively to provide a climate and an incentive for innovative ideas. This is a sensible and effective use of the buying power of the government.

From this process came several basic conclusions which are woven into the fabric of the 17 specific recommendations.

The first major conclusion is that there is an urgent need to reduce excessive regulation and to reverse the attitudes of regulatory agencies from restrictive and punitive to forward-looking and supportive. The impedimenta that has been accumulating is choking innovation and must be stripped away, as difficult as this may be. Recent progress in the FAA is encouraging here. It is not suggested that there be no regulation—but regulation must be structured and costed; it must provide incentive and stimulation.

The second major conclusion is that the initial steps taken by the Office of Federal Procurement Practice (OFPP), as typified by OMB Circular A–109, appear to be clearly setting the precedent of encouraging and stimulating innovative practices in major system procurement. If the principles of A–109 can be applied creatively to the mainstream of procurement practices and policies in other fields, a new thrust toward innovation could be achieved. This does not mean that A–109 has been successfully implemented yet—it just means that it is the initial step in the long process of change.

Finally, it is hoped that government does not become preoccupied with the cost of implementing these recommendations. The return on investment is more important than initial implementation costs. There is probably no way of knowing just how much government regulation and control costs us now, but it has been estimated at $100 billion. If these recommendations can make it just a bit easier to do business, and regain our traditional leadership in technology, the cost would be minor.

The 17 recommendations cover four primary subject areas:

I. Federal Procurement Policy, including the OFPP and OMB Circular A–109.
II. Independent Research and Development
III. Patents and Data Rights
IV. Government and University Basic R. & D.

I. FEDERAL PROCUREMENT POLICY

The Committee was supportive of the intent of OMB Circular A–109, and the way that the OFPP is approaching its challenge. This led to recommendation No. 5.

No. 5. The President should issue a clear directive that the reforms in OMB Circular A–109 be applied as soon as possible throughout all Federal agencies, and that OFPP be strengthened and its life be extended beyond September 1979 to monitor this.

To further amplify this position, the committee examined in detail the implications of A–109 in all categories of government procurement. There was unanimity of opinion that the thrust of the OFPP was proper, and that expansion of A–109 should be encouraged. The OFPP and A–109 are supportive of innovation—not by trying to centralize, regulate, and minutely control, but by opening the door to decentralized innovation with competition rather than by centralized bureaucratic control. A–109 also recognizes that innovation can originate with a single individual, in a small organization, and therefore gives them every chance to be heard.

To complement recommendation No. 5, there were four more recommendations speaking to specific details.

No. 2. To encourage innovation in the procurement of common use items by the application of the fundamental principles of A–109, a new and more forward-looking policy in this area should be developed and promulgated by the Office of Federal Procurement Policy (OFPP) in consultation with the Department of Commerce and General Services Administration (GSA).

No. 4. It is recommended that a national policy statement be developed by OFPP that establishes the goal of having the Federal Government stimulate innovation by providing a market for innovative products in the early stages.

No. 6. One official should be designated for acquisition in each agency in the same manner as is presently being done in the Department of Defense.

No. 17. The President should call on each Federal agency to propose for review by the OMB new Federal procurements and cooperative agreements which would encourage significant industrial innovation in selected areas of importance to the agency's mission. In line with this, the OMB's Office for Federal Procurement Policy should be designated as the "Office for Federal Procurement and Assistance Policy."

II. INDEPENDENT RESEARCH AND DEVELOPMENT (I. R. & D.)

The next major area on which the committee concentrated was I. R. & D. I. R. & D. is a DOD term not universally applied to all industries; for this report it was defined as:

> That R. & D. which is normally company initiated and company sponsored and is paid for either as allowable overhead or by profit dollars.

The DOD differentiates I. R. & D. from R. & D. which is research being done under contract. The problem the committee addressed was that the most important feature of I. R. & D. is the capital "I"—Independent. A problem now exists with excessive centralization and bureaucratic review and approval of some I. R. & D. for relevance before allowing the costs to be allowable overhead expense. In the interest of protecting the taxpayer from real or imagined abuses of allowable expenses, a system has been created that clearly stifles bold innovation in I. R. & D. and slows the growth of basic knowledge. Thus the committee recommended:

No. 7. Recognize OFPP's views that I. R. & D. is an ordinary cost of doing business and remove the requirement for Potential Military Relationship (PMR) of I. R. & D. associated with DOD contracts. Let the competitive marketplace judge the technical quality and relevance of competitive I. R. & D. programs.

Recommendation No. 7 clearly states the Committee's concern. These next five recommendations speak to other specific items requiring reform:

No. 8. Eliminate negotiated dollar ceilings for I. R. & D. and Bid and Proposal (B&P) costs, substituting the criterion of reasonableness, and eliminate burdening of I. R. & D. and B&P costs.

No. 9. Deemphasize the practice of technical evaluation of industrial I. R. & D. programs by government agencies.

No. 10. Develop an innovative program under the leadership of the National Science Foundation (NSF) to increase the support of programs of national interest by small innovative companies, and the testing of their innovative products and concepts.

No. 3. It is recommended that programs be created by GSA to improve the exchange of information between industry and government, and to improve the product awareness and industry knowledge of contracting personnel.

No. 1. Secure enactment of H.T. 10146 or 10749 or equivalent bill to eliminate the practice of procurement "auctions."

III. PATENTS AND DATA RIGHTS

Patents and data rights is a complex issue between industry and government. It wasn't the Committee's intention to provide an exhaustive dissertation on the subject—that was the task of another subcommittee with whose recommendations it concurred but it did offer some comments and recommendations from the perspective of procurement practices.

No. 12. The Department of Commerce should be given the responsibility, in consultation with other agencies and NAE, to develop a uniform policy applicable to all departments of government, transferring the patent rights on the results of government-sponsored research to the private sector for commercialization. The Government would retain a nonexclusive license to use and have made for its use inventions founded in whole or in part by governmental expense.

In amplification of this basic statement, three supporting recommendations were made.

No. 11. The Department of Commerce, with the cooperation of the National Academy of Engineering (NAE), should review the time versus return on patents to see whether the incentive for innovation would be significantly increased by extending the life of patents from 17 to 25 years.

No. 13. The Government should negotiate reciprocity agreements with foreign countries, or require equivalent filing and annual fees for U.S. patent

quisition in each agency in the same manner as is

registration for those countries which will not agree to reciprocity.

No. 14. The OFPP, in consultation with other agencies of government, should develop and promulgate a uniform "policy statement" such as the proposed policy which follows. (section VI) This proposal sets forth the respective rights of the Government and the contractor in the technical data first produced under a contract and in proprietary data used in the performance of a government contract. This should include a section specifying that a contractor will be provided appropriate compensation for the loss of rights in data through improper or unauthorized use of disclosure of proprietary data by the Government.

IV. GOVERNMENT AND UNIVERSITY BASIC R. & D.

The last major issue the committee addressed was the support of government laboratories and universities to do more basic R. & D. leading to increased industrial innovation.

No. 15. A blue ribbon commission should be convened under the leadership of the President's Science Advisor with representatives from NAS, NAE, government laboratories, and Congress to review U.S. university Research and Development and recommend new levels and kinds of support.

This should not be a new centralized committee with continuing existence, but a short-term, limited-life review group to make its recommendations and disband. Decentralized stimulation is essential, as has been emphasized throughout this report.

Corollary issues are the ability to stimulate innovative R. & D. in the universities and the tendency of government labs to exclude industry from early participation in innovative approaches.

No. 16. The NSF, with the cooperation of the Treasury, Department of Commerce, NASA, DOD, and NAE, should explore the establishment of a new, decentralized industry-university Research and Development support program oriented toward promoting innovation in universities through tax deductible industry grants.

II. SOME FUNDAMENTALS OF INNOVATION

In attempting to suggest government programs or policies which might be helpful to improve industry's innovative capabilities, it may be useful to outline some basic characteristics of innovation to serve as a checklist against which these programs or policies could be evaluated:

The Beginning of Innovation

It should be recognized that the process of innovation begins with a new idea generated by a single individual. It is, indeed, normal to have new concepts brought to fruition by a group of people, or an element of industry, but essentially any new concept begins with one person. Therefore, any rules, regulations, or incentives should recognize that the creative individuals within industry should be permitted to work in an environment that is conducive to creation. This implies freedom to associate with other equally creative people, the availability and access to data and other forms of information in their field of interest, and finally, freedom to discuss their ideas and publish their conclusions so that these contributions may be evaluated by their peers. Although this sounds as if it were applicable only to scientific and technical creators, it is equally applicable to those who are creative in management and other specialty skills, such as manufacturing and processing.

The Time Required

Innovation cannot be recognized fully until the idea that starts an activity has been tested philosophically, technically, and in some cases, socially. This process, depending upon the idea itself, takes a substantial amount of time. It is rare that an important innovation can be recognized as such or will have a major impact short of 4 or 5 years, and, more frequently, the impact of a major innovation—its lead time—may not be felt for a decade or two. Thus "innovation" can't be turned on or off to achieve a predictable result nor can there be any reliable estimate of the eventual impact.

The Character of Incentives To Innovation

When one recognizes that individual innovation and the process that brings it to maturity both depend on the environment in which the idea is generated and nurtured one sees that a deliberate incentive to produce innovation is not easily defined. It is probably impossible to conceive of a process to produce "innovation" on call. What must be created is an environment in which an idea can be heard and evaluated and at the same time provides some promise that the wherewithal, be it money, facilities, or talented help, exists to bring the idea to fruition. Creative people respond innovatively to urgent needs. It is still true that "Necessity is the mother of invention."

Motivation and Reward for Innovation

Essential to the environment within which innovation will take place is an atmosphere of reasonable assurance that a good idea or a new approach to a problem, if proven to be a major contribution, will bring with it reward to the individual who had the idea, and to the combination of individuals who brought it into being. These rewards come in many forms—public recognition, peer recognition, money, freedom to create again, and profit. The innovators should know that combinations of these rewards will not be artificially restricted. An excessive tax on capital gains and reinvestment destroys the incentive for entrepreneurial innovative ventures, and dries up essential venture capital markets.

The Concept of Risk

Any innovation, because it is something that has not been done before, brings with it at least some risk that it will not be successful. Thus, an environment which is conducive to innovation must implicitly be an environment within which additional risk taking is acceptable. American society today seems increasingly timid of risk associated with technological change. A major implication of added risk is that many who provide innovative contributions may be unequipped to accept the full consequences of failure. This may hold true for an individual or a company. The concept of containing the consequences of failure for the innovator, permitting him to be exposed to only a limited risk, is essential for many new ideas or concepts to be developed to their full potential. Technical uncertainties are inherent and acceptable in high-technology ventures. Such problems can be attacked with vigor and confidence. Much more inhibiting to innovation are uncertainties in areas of changing government policies—particularly in tax, legal, and regulatory areas.

The Momentum of Innovation

New ideas, invention, new concepts of management and processing all have one common characteristic. As the innovation is developed, further innovation will be required in order to accommodate to each new concept and bring it into everyday use. A prolonged learning experience is involved, and the new innovation demands new peripheral concepts in order to become fully mature, sparking additional innovations. Having alert, young-thinking associates to assist in support of new innovations leads to a continuous creative environment.

The Impact of Peer "Experts"

As noted briefly, one of the major hurdles which any innovation must surmount is peer evaluation. This can take place in the normal course of events with associates or, as in the case of many innovations which require evaluations by large organizations (major industry or government), special teams can be assembled to provide this evaluation. In order to protect the delicate health of an innovation in its infant period, it is essential that the evaluation not be premature, and that the participants in the evaluation process be selected with care to prevent high infant mortality. It is often true that a critic's intelligence appears to be more powerful and his satisfaction increased if negative criticism is extensively cataloged on any new concept. By recognizing and calling attention to all of the potential hazards and risks of a new idea, one can be sure of a high intellectual batting average, *but the idea may be killed.* Thus, intensive evaluation of an innovative concept by decisive, experienced critics should be delayed as long as possible, preferably until the idea has been provided with some kind of demonstration of its value and workability. There are legitimate groups of critics, such as organizations concerned about environmental impacts. But there are also powerful antitechnology organizations with effective legal, publicity, and political arms which have become active in the United States in recent years with the objective of blocking the introduction of technological advances. Examples can be cited in the energy, pharmaceutical, and other industries. The long-range results of technical stagnation are unacceptable to forward-looking Americans: low productivity, high costs, inflation, a plummeting dollar, energy and material shortages, balance of payment problems, and a reduced standard of living that falls hardest on the poor and the disadvantaged. Decisive government leadership will be required to return the country to a more balanced national environment that encourages technical innovation.

III. OVERCOMING BARRIERS TO INNOVATION

Improvement of the procurement process to encourage innovation requires a better understanding by government agencies of the enterprises with which they do business. This section seeks to define the serious consequences for our country of government policymakers' failure to understand the critical role of the entrepreneurial function of both large and small businesses in the process of putting scientific knowledge to beneficial economic use. We are a nation of people who seem to be developing a great aversion to risk; we therefore ask government at all levels to respond with increasing regulation and legislation. These factors produce serious constraints to innovation.

Dr. George M. Low, the President of Rensselaer Polytechnic Institute, in his National Academy of Engineering Founders Award lecture, very clearly stated the problem:

> Today, technological innovation in the United States is faltering—faltering not because there is a shortage of new ideas, but faltering because new laws and regulations and current economical policies provide disincentives, rather than incentives, for new technological developments.

This section discusses the problem from the perspectives of large and small business, incentives for innovations used by other governments, financial accounting of innovation costs and carried-forward tax loss, the need to eliminate "best and final offer" negotiations, and the Government procurement of innovative common use items sold commercially.

A View From Large Business

There clearly is a need for a long-range national policy to support increased research and development aimed at industrial innovation. The basic objectives of such a policy should be to reduce government policy, tax and regulatory uncertainties in order to promote entrepreneurial investment by improved industrial profitability and capital formation. This is essential to ob-

innovations leads to a continuous creative environment. ... reduced standard of living that falls hardest on the poor

tain the innovation and increased productivity that are made possible by intensified research and development.

Specific actions should include the adoption of new policies that enable government contractors to realize earnings reasonably comparable to those attainable in commercial ventures. Such actions have been identified in the DOD profit policy study entitled "Profit '76." It provides a realistic assessment of why defense oriented industry has fallen into poor condition, and points the way to remedial actions.

Improvements in procurement practices along these lines will aid in solving the pressing problem of American industry today with regard to capital formation. Suggested actions include the recognition that an inflation factor be incorporated in depreciation accounting procedure; recognition of the cost of current high interest rates associated with working capital; increased investment tax credits and their expanded application to research and development plant and equipment investments and a new policy to stimulate Independent Research and Development (I. R. & D.) programs throughout industry, and private ownership of industrial facilities.

In this report, the Department of Defense term I. R. & D., is used to describe any research and development which is normally company initiated and company sponsored, and which is paid for by the company either as allowable overhead or by profit dollars. By using this DOD term to describe any company initiated R. & D. there is a differentiation from the term R. & D. which, in the DOD, means government-sponsored and paid-for R. & D. This definition of I. R. & D. and R. & D. will be used throughout the report.

The current ceilings imposed by Public Law 91–441 on the amount and content of I. R. & D. costs which can be recovered under a company's government contracts should be liberalized with the test of "reasonableness" substituted for downward negotiation. I. R. & D. is a necessary and legitimate cost of doing business. I. R. & D. should be independent and decentralized with respect to direction and execution by the performer: free from detailed technical audit beyond the test of reasonableness by centralized government. Except for the largest production contracts, the competitive marketplace should determine the level of I. R. & D. that a company should support, not an artificial limitation by government. This would also free margin dollars so that they could be invested in productivity improvements which are so vitally needed to combat inflation. (This subject is discussed in greater detail in section V.)

A long-range national policy on R. & D. should spell out the objective of reversing the steady decline of Federal R. & D. expenditures as a percentage of the Federal budget and identify the goal of a stable level of such funding for an extended period in the future. Multiyear funding of specific exploratory research or developmental programs should be an initial step in reversing the decline in the percentage of the U.S. gross national product spent on R. & D., which dropped from 3.1 percent to 2.2 percent from 1966 to 1976.

The Committee recommends an early review of the negative incentives to innovate which arise from current procurement regulations and policies covering organizational conflicts of interest, patent title, cost sharing, and disclosure of proprietary data and trade secrets. For any of these recommended policy changes and reversals to be productive, they must be approached as basic and long-term objectives rather than as temporary expedients.

From the perspective of large business, it is clear that a national climate that encourages the formation of small entrepreneurial high-technology ventures is of critical importance. Such firms acting as specialist subcontractors provide significant innovative contributions to major systems businesses.

A View From Small Business

Most innovators require outside sources of capital to launch their entrepreneurial businesses. Initial "seed" capital requirements are greater today than ever before due to inflation and the high costs of complying with increasing government involvement. Yet, risk-capital of all kinds—seed, startup, and expansion—has become scarce since 1970 due to an array of Federal policy decisions, particularly in the excessive tax on capital gains. There is no greater constraint to technological innovation in America than this recently developed shortage of investment capital for innovative small businesses.

There has been a dramatic decline in the capital acquired by public offerings for firms with less than $5 million in net worth from $1,457 million for 1969 to $16.2 million in 1975. In the same period, the money raised by all corporations in the public securities market increased from $28 billion in 1972 to over $41 billion in 1975, or almost 50 percent. According to a Department of Commerce study, from 1969 to 1975, the total number of companies seeking equity funds for growth dropped 92 percent—from 1,800 to 150. Of these, the number of small companies going to the equity market dropped 98.6 percent from 649 to 9.

Some reasons for this decline in small business financing are:

- Limitations on investment in entrepreneurial, high-risk small businesses by large pension funds.
- The centralization of investment decision making.
- Our desire to prevent security fraud through increased regulation.
- The increase in capital gains taxation since 1969 that has nearly destroyed the incentive for investors in high-risk innovative ventures.

The 1977 report of the Joint Economic Committee of the U.S. Congress recognizes the last problem and its solution. "Our present tax structure," the report says, "encourages consumption and discourages savings and investment by placing a heavier tax liability on dollars saved than spent."

During a recent presentation, Dr. William F. Ballhaus, president of Beckman Instruments, Inc., explained the effect of capital rollover on capital mobility which

will be used throughout the report.

is now severely restricted by tax laws. He used, as an example, a $10,000 investment that has increased in value to $100,000 after 10 years.

> "The investor wants to invest in solar energy, which our country sorely needs and which, in time, could produce an excellent return. Under the present tax system, he would need an immediate increase over his present rate of return of as much as 62 percent on his solar energy investment just to break even after taxes. That is unlikely, so he stays put and solar energy technology, and the country, suffer. Under capital rollover, the total investment could be put to work immediately in an urgently needed new technology with promising growth potential for the country and the investor."

The Joint Economic Committee's report calls for "tax incentives that will facilitate capital investment and thereby enhance the ability of our private sector to provide new jobs, increase productivity and wages, help achieve energy independence, and promote the economic well-being of our citizens."

Five simple changes in our tax laws will provide these incentives. The changes are embodied in H.R. 12263, The Security Reinvestment Act of 1978, introduced by Representative Barber Conable of New York. In essence, H.R. 12263 would permit tax-free rollover of capital investments as long as funds remain invested and allow full write-off against other income of capital losses and the interest on funds borrowed for investment. The key elements of H.R. 12263 are:

1. Permit individual taxpayers to elect to give up special tax treatment of capital gains on securities transactions.
2. After such election, tax any gain retained from the sale of securities as earned income, averaged over the years the investment is held.
3. If the total proceeds from the sale of securities are reinvested in securities within an 18-month period, the gain is not taxed, but the basis of the new securities is reduced by the amount of the untaxed gain.
4. Permit the individual taxpayer to elect to write off the losses on a securities transaction against other income if he has made the previous election and only on securities purchased after making that election.
5. Eliminate the $10,000 limitation on deductions from other income for excess investment interest expense.

The rollover of capital gains would keep billions of investment dollars at work creating real economic growth and with it tax revenues far in excess of those currently realized. Moreover, these investment dollars could be moved at will from areas of capital surplus to areas of capital shortage where needs and opportunities were greater.

The need for a climate favorable to small business innovation is clearly apparent from the history of the many contributions made by individual entrepreneurs in their small companies to the past and recent economic growth of our country. *If we are to continue to enjoy the benefits of innovation, then individual entrepreneurs and their small companies must be able to carry a large share of the burden of innovation.* Therefore, we must reverse government policies that discourage small business by inhibiting capital investment, imposing excessive regulatory and legislative burdens, and failing to encourage full participation in government procurement.

Incentives for Innovation Used by Other Governments

A review of international Policies for Stimulating Industrial Innovation (PSI) is displayed in the following chart. It should be noted that the United States and United Kingdom are minimal in their direct financial assistance to industry as compared to the grants, joint venture, and equity sharing which exist in Germany and the loan program used by Japan. France uses all methods of financial assistance except joint venture risk sharing.

The United States puts a great effort in the publication of U.S. developments and in technical information dissemination to industry—benefiting both U.S. companies and the whole world. Other nations, however, promote their industry's proprietary positions more effectively.

Although it is difficult to gage the results of these differing policies, it is significant that the Germans and Japanese, whose essential ingredients include innovation and capital investment, have raised their economies with minimal inflation through increased industrial productivity.

It is understood that the Canadian Government was not satisfied with its "Program for Advancement of Industrial Technology" (PAIT) results. The evaluation procedure was costly, lengthy, and inconclusive, still requiring the innovator to bear all the proposal costs through this period. When finally approved, the government's financial participation in the innovation process was limited to 50 percent. As a result of their experience, Canada increased the flexibility of their financial and tax accounting for investment in innovation. For example, Canada has increased the current tax credit for I. R. & D. from 5 percent to 10 percent in order to give an immediate tax incentive to I. R. & D. Further, Canadian industry is now allowed to expense I. R. & D. in the current year or to defer it, whichever provides the best tax advantage. Not only can they write it off in the current year but they can also write off an additional 50 percent as a further incentive. These tax advantages and write-off provisions are applicable to all I. R. & D., not just that applicable to government contracts.

The general conclusion to be drawn from the experience of other nations is that there is no adequate substitute for decentralized market-oriented enterprises with access to risk-capital attracted by the prospect of reward. Another conclusion is that timelier regulatory actions abroad have resulted in benefits to the overseas public. For example, other nations have had access to improved pharmaceuticals before their benefits were available to Americans. Overregulation to avoid risk does not produce the lowest overall risk for the public.

Financial Accounting of Innovation Costs and Carried-Forward Tax Loss

In 1974 the Financial Accounting Standards Board of Stamford, Conn., recommended* that R. & D. expenditures be amortized in the year they were expended as opposed to the previous freedom to choose between an immediate versus a 5-year or longer write-off period. This creates few problems for innovation efforts being funded by a major production company or by an investor currently making a profit, because expensing R. & D. costs in the same year reduces the current tax paid and reduces the financial impact on the investor should the R. & D. results fail to achieve the desired objective.

However, if the innovator is just starting up or does not currently have profitable production, the requirement to write off all R. & D. costs immediately is a detriment to the financial balance sheet and profit and loss statement, discouraging investor interest.

The reasoning behind this "regulating standard" is to show the least attractive financial posture of the enterprise to a potential investor as a warning of the risks of investing in innovation. This objective has been met, but the excess conservatism and inflexibility is reducing investment in innovation. A more flexible amortization policy is therefore advocated to stimulate investment in innovative business ventures.

From a corporate management viewpoint, this practice would limit innovation costs to an allocation of funds within the current earnings, if any, to keep the financial reports to the board and stockholders acceptable. Long-term commitments to innovation can only be sustained if profit levels remain sufficiently high every year. If profits are threatened, R. & D. is the first expenditure to be reduced under current accounting and tax standards. This is in contrast to real estate, physical facilities, and equipment or machinery which are capitalized and their cost apportioned annually over their useful life. The same flexibility should be afforded investment in innovative efforts. Part of the problem is due to the lack of technical understanding by the accounting profession and its inability to assess whether an innovation has any market value. The United States grew with such business freedom, however, and without such flexibility, it is growing less.

Further, since the IRS only allows a loss incurred in a given year to be carried forward and applied against future earnings for 5 years, this immediacy in writing off effectively reduces the time over which the loss can be utilized. If, as is often the case, no profit is achieved in the 5-year period, the tax use of the loss is lost and subsequent profits are fully taxed. For this reason, the IRS should allow R. & D. costs to be capitalized and amortized over a time period equal to the life of the patent. The financial statement and cash flow of small technical enterprises would then appear less conservative and more realistic to an investor or creditor.

Losses should be applicable to offset profits well beyond 5 years, since complex modern technology and today's regulatory climate frequently require longer recovery periods for development, test, approvals, sale, and production.

* See appendix A.

Eliminating "Best and Final Offer" Negotiation

An important single feasible advance in Federal acquisition practice that could dramatically improve the environment for technological innovation by U.S. industry would be the enactment of the proposed Federal Acquisition Act known as the Chiles Bill, Senate Bill No. 1264, or equivalent. There are two corresponding Bills in the House known as the Downey Bill, H.R. 10146, and the Wydler Bill, H.R. 10749. The most favorable form of the Bill would be the Wydler Bill because it would stop the Federal acquisition process known as "best and final offer" or "parallel negotiation"—or simply the "auction"—in which, after an initial round of bids from competitors are opened and the prices and technologies have become known to government officials, the government officials then hold discussions with the competitors, potentially transfusing the technology and information on competitive prices before running another round or rounds of bidding. Sections 302 and 303 of the earlier version of the Chiles Bill would have prohibited that practice, as does the Wydler Bill version.

RECOMMENDATION

No. 1. Secure enactment of H.R. 10146 or 10749 or equivalent bill to eliminate the practice of procurement "auctions."

A View on the Procurement of Innovative Common Use Items

On the surface it would appear neither logical nor reasonable to advocate that the Federal Government play a leading role in the development of new technology for common use or consumer type items. However, it is entirely sensible to suggest that the Federal Government, as a major purchaser, should be *supportive* of innovative companies and their products. Much that occurs in the Federal Government's current procurement practices suggest that their role is exactly the opposite.

The innovation that occurs in the portion of our economy concerned with the production of common use items is generally stimulated by the commercial marketplace. A company develops new technology and products because of its desire to maintain or increase market share and profitability. Despite the magnitude of the Federal market, it is rarely available for innovative new products. The cost of development of the new technology in the early years of an innovative product life cycle must be supported solely by the commercial market.

There are probably many contributing reasons for this phenomenon. Here are some basic reasons that are at the core of many of the Federal Government's procurement problems:

1. Aversion to Risk in Large Organizations.—This seems to be a trait within the Federal establishment that is almost universal among all employees involved

in the expenditure of tax dollars. Saving the taxpayer's dollars in laudable, but excessive caution can lead to techniques designed to protect the Government which actually achieve the opposite effect. Overcaution often serves as insulation against new developments existing in commercial markets that could save money.

Significantly, the situation has deteriorated since the GSA has been in the public spotlight for a multitude of alleged abuses. In fact, the press, Congress, and the public at large have all seemed so anxious to condemn GSA failures that rational approaches to improved procurement are being ignored.

Instead of acknowledging that a normal level of business risks must be expected in an operation like GSA if it is to perform efficiently the function originally intended, the public expectation is that GSA should be able to achieve and maintain perfection. This attitude only strengthens the contracting personnel's already inherent aversion to taking any action which has even the possibility of risk. Such excessive caution in procurement is an absolute deterrent to the introduction and acceptance of innovative ideas or products.

2. The Use of Detailed Specifications.—Much has been written about the negative results of using detailed prescriptive specifications and many examples can be cited. Most of the specifications used by the GSA and other agencies for the purpose of procuring essentially common use items result in designs which differ significantly from products available in the commercial market. These differences add to the cost of the item as well as to the risk of the contractor who wishes to sell to the Government, and do not usually provide a proportionate improvement in product reliability, durability, or usability.

Part of the problem with prescriptive specifications is that the resources available for specification development in the GSA are limited so that keeping specifications current is an impossible task.

Even if it can be assumed that keeping prescriptive specifications current with the state-of-the-art of commercial production is a desirable goal, industry and Government would have to recognize the potential inherent problem of technological transfusion. Under current procedures, the innovator would not stand to benefit from his innovation if it were to be incorporated in a specification and disseminated to other bidders. The result would be a reluctance to share new technological innovation with Government purchasing agencies.

The solution often given to the problem of the prescriptive specification is to use functional or performance specifications. In fact, the GSA has tried this procedure with some success. All too often, however, a performance specification theoretically developed to attract competition among several commercially available and acceptable products results in the purchase of an inferior product. The traditional solution is to "tighten up the specification" with the result that it becomes more prescriptive, often to the point of eliminating the commercial product.

The following examples illustrate some typical areas of "tailoring" which mutate a standard commercial product and, in the process, can tend to suppress competitive participation and inhibit the acceptance of innovation.

a. *Household Refrigerators.*—There is no question on refrigerators' operating characteristics, UL compliance, and system integrity, as provided for under the Federal Spec, since these criteria are totally reflected within industry standards.

The divergence begins once the basic product "framework" is established. The series of changes, required by the Federal Spec, add substantial cost factors without providing any measurable improvement in the usability or durability of the product itself. The average useful life expectancy of a household refrigerator still remains in the 15–17-year range. (Under the last ETIP/GSA refrigerator procurement, the life-cycle cost formula was projected over a 15-year life-cycle span.) The cost premium includes both the direct and indirect expense of producing and warehousing a special GSA model that is similar to, but not quite the same as, the basic model that is available as a standard commercial product.

b. *Hand Tools.*—The Hand Tool Division of GSA has been particularly receptive to recommendations and suggestions that would accept innovations and effect savings without reducing the quality of the product itself.

It agreed to accept standard commercial packaging on several definite quantity purchases of handtools in early 1978. Although the total of these purchases was less than $100,000, acceptance of standard commercial packaging afforded a $4 savings per package over the same product assortment packaged in accordance with the original government packaging requirements.

Since that time, the majority of solicitations from the Hand Tool Division have specified standard commercial packaging.

In another instance the division allowed a slight deviation from the specified outside dimension of a box end wrench and were able to purchase a superior product at a lesser cost than the product as originally specified. The maximum wall thickness, as specified, was less than that found in the standard commercial product category. By accepting the heavier wall thickness they realized a savings of approximately 4¢ per wrench or 3 percent of the acquisition price.

These examples simply illustrate the Hand Tool procurement group's familiarity with industry practices and products, and associated acceptance of innovative approaches.

3. Procurement Techniques.—Rarely does GSA examine the procurement technique or the quality control acceptance procedure in order to avoid continued purchase of a deficient product. This approach only encourages the "Government Manufacturers" to continue to "beat" the specifications. GSA's approach actually favors the supplier since GSA assumes the burden of proof. This apparent attitude has been supported by the rulings on disputes by both the General Accounting Office and the Board of Contract Appeals, and inhibits innovation.

A few relevant examples are:

a. *Household Garbage Disposals.*—In this instance, a divergence from the basic commercial product developed when the Federal specification was justifiably "tightened up" to eliminate the submission and potential acquisition of a product with unacceptable quality.

An inadvertant overreaction developed resulting in the establishment of a constrictive material requirement which did achieve the desired upgrade, but the "overreaction" added an unnecessary material premium which was incompatible with the desired cost/quality pricing range.

By Spec definition and reference, the manufacturer would be required to fabricate the stationary ring, rotating shredder plate, and swivel lugs from stainless steel. Stainless rings and shredder plates are available within the industry on top-of-the-line models. Conversely, stainless lugs have proven to be inferior to those composed of copper infiltrated powdered iron with a zinc coating.

Hot dipped zinc coated steel, properly surfaced, will provide the desired level of material integrity for the ring and shredder. Mandatory use of stainless adds a direct material premium of approximately $1.07 per unit, or 6 to 7 percent of base manufactured cost, and can inhibit the acceptance of innovation in this area.

b. *Metal Office Desks.*—Six years ago GSA developed a specification which it felt would generate competition among quality manufacturers. The specification appeared to have been written in such a way that it would permit a number of manufacturers to bid, and the successful low bidders could supply their standard commercial products. In spite of this concerted effort on the part of GSA to improve quality and stimulate competition, the initial production against these specifications proved to be unsatisfactory and very much inferior in comparison to contemporary metal desks commonly available in the commercial market. To overcome this problem, GSA was forced to add more detail to the specification. Over a period of years the cumulative effect of this practice has so drastically altered the specification that desk manufacturers can no longer bid their standard product. If a manufacturer wishes to respond to a government solicitation for metal desks, he must be willing to produce a desk especially for GSA because no commercially available desk fits the item described in the specification. The type of container in which the desk is shipped is also specified. These containers, which are quite costly, also differ from those used in commercial practice even though the same modes of conveyance are used by both commercial and government buyers.

4. Emphasis on Lowest Purchase Price.—When a specification of any type is used in the procurement of an item, the award is generally made on the lowest bid price that meets the specification. Product evaluation techniques such as life cycle costing, which allows consideration of performance cost characteristics in addition to the initial purchase price, are still in their infancy. Application of such techniques to the purchase of many common use items will be difficult.

The emphasis on the lowest price cuts profit margins, making less money available for the development of improved technology. An innovation that added a few cents to the price of the can of paint but saved dollars in the application and life of the coat of paint would not be accepted under current practices. Further, an innovative company that develops a new product or a better way of making an old product could end up with a smaller share of the Federal dollar because the revised product either doesn't meet the specification or the item has become noncompetitive from a price standpoint.

When the basis for making an award is price alone, there are usually contractual requirements in addition to the specifications that reduce competition and hinder the acceptance of commercial products. An example of this is Latex Interior, Exterior Paint.

The packaging and marking requirements of the Federal Spec along with the Q.P.L. requirement, when applicable, discourages a number of companies from participating in the bidding process even though their product meets all of the material, formulation, and quality assurance criteria.

Among the many special marking requirements are the following, which must appear on each one-gallon can:

- Manufacturer's name
- Manufacturer's batch number
- Date of manufacture (month and year)
- Contractor's name and address
- Contract number
- Specification number

If the contractor/manufacturer is attempting to provide a commercial, off-the-shelf product, he must either apply an overprint label which carries up to 12 special marking line listings or use the special label as a primary means of identification at the time of actual production.

In either case the contractor is faced with potential obsolescence and the distinct possibility that any carryover would have to be reworked and recanned or, at best, just relabeled. Inclusion of the specific contract number in the special marking requirements almost assures an "obsolete" carryover since the term contracts are bid on a 6-month incremental basis.

Summary and Recommendations

In summary, a prescriptive specification in a low bid procurement is the present method used by most contracting officers to reduce risk. It generally prevents the proper evaluation of new products and their subsequent purchase by government agencies. This methodology stifles innovation and creativity on the part of successful contractors.

The situation is a complex one and will be difficult to change. This is particularly true in our present environment where the GSA has become highly sensitive to charges of paying excessive prices for contract items.

There are a few recommendations that can be made which, if adopted, should eventually result in a

strengthening of the government's role in technology stimulation.

The concept of approaching the purchase of common-use items from a functional standpoint seems to be at the core of ADCP. If this can be achieved, it should be possible to attract competition among commercially available items.

However, it must be recognized that the ADCP policy, as currently written, is not concerned with the concept of innovation. The Government can play a major role in the area of innovation, even for common-use items, by acting as an early market for new products, particularly for small firms. The objective is to use the Federal Government market to help stimulate the development of new technology for commercial products. If the ADCP policy is going to be expanded so that the evaluation of innovative products is encouraged, procurement techniques other than the straight low bid need to be developed.

Even with functional specifications, the low bid procurement method has certain characteristics that serve as deterrents to commercial product acquisition and, thus, to the acceptance of innovative products. It must be recognized that innovation is likely to have a higher initial purchase cost. However, there are often other cost-saving benefits that can be enjoyed during the life of the product. The Government needs a way of evaluating these benefits.

There does not appear to be any single solution that can be applied across the total range of products. While there is a need to research new approaches within these areas of procurement, it would seem prudent to maximize usage of the options that are currently available: Purchase Description/Commercial Item Description, brand name or equal, and multiple award.

RECOMMENDATION

No. 2. To encourage innovation in the procurement of common use items by the application of the fundamental principles of A–109, a new and more forward-looking policy in this area should be developed and promulgated by the Office of Federal Procurement Policy (OFPP) in consultation with the Department of Commerce and General Services Administration (GSA).

The OFPP's new policy on the Acquisition and Distribution of Commercial Products (ADCP) is given a qualified endorsement. It is suggested that it be expanded to include the concept of innovation.

OMB Circular No. A–109 has been developed to improve many of the procurement methods used for the acquisition of major systems. While the same technique would undoubtedly prove excessively cumbersome for the purchase of many common-use items, the basic philosophy of mission analysis must have a counterpart that can be used for these purchases.

In the purchase of common-use items, the GSA will be the key to the success of any new policy since that agency makes the majority of the purchases. The GSA should work closely with the OFPP in the development and utilization of any new policy.

By using A–109 in this way, GSA in conjunction with the mission agency, can stimulate product development *and* serve as a market for product verification. Further, the application of the A–109 policy may have real application for those agencies with "missions." The DOE, EPA, and DOT have congressionally approved "missions" which require product innovations. GSA can assist these agencies using an A–109 approach.

RECOMMENDATION

No. 3. It is recommended that programs be created by GSA to improve the exchange of information between industry and government, and to improve the product awareness and industry knowledge of contracting personnel.

The success of any effort to develop alternative procurement methods will depend upon the knowledge the government buyer has about both the product and the industry. Such specialized knowledge is equally as important as knowledge of procurement regulations and procedures. All too often this factor is ignored in the development of procurement personnel.

The GSA should try to insure that their contracting officers become specialized in specific commodities. This can be done by organizing the procurement function by commodity. In addition, the contracting people should be encouraged to attend trade shows and seminars. Oftentimes attendance at such functions is discouraged because they are viewed as undesirable situations where the contracting officer's objectivity could be weakened by offers of food and drink, ignoring the value of such contacts for information exchange.

If the Government is going to play a leading role, as it should, it is essential that communications be improved between industry, the procurement personnel, and the ultimate user. In order for this to work, there must be a high degree of trust in those people performing the procurement function—both in their capability and integrity.

RECOMMENDATION

No. 4. It is recommended that a national policy statement be developed by OFPP that establishes the goal of having the Federal Government stimulate innovation by providing a market for innovative products in the early stages.

IV. REFORM OF FEDERAL PROCUREMENT POLICY

WIDESPREAD IMPLEMENTATION OF CIRCULAR A–109

The implementation problems of the reforms promulgated in OMB Circular A–109 are unique and difficult. A–109 only addresses the problem of the acquisition of major systems by the Federal Government. Department of Defense systems immediately come to mind—but all departments develop major systems and it is the orderly and efficient acquisition of all of these systems

that is important. As a corollary to system acquisition is the need to continually introduce into new systems new technology and innovative ideas—and, more importantly, to provide a climate that not only allows but encourages continuous innovation.

The A–109 concept attempts to insure that industry receives early indications and guidance concerning actual needs of the procuring department, so that meaningful effort can be focused on solutions to real problems. Emphasis is placed on innovation and competition. Also, in recognition of the historical fact that many new ideas and new technology comes from the small industry base, a unique attempt is made to make sure that size of a company is not a restriction to having an opportunity to participate. Early emphasis on competitive exploration of alternatives and freedom to propose individual technical approaches attempts to prevent procurement of costly or less effective systems. To do this, firm principles must be established to allow:

- A freely operating competitive environment with equal access for all companies regardless of size;
- The elimination of protectionism and parochial influences;
- Incentives for innovation, quality, and productivity through adequate reward;
- Establishment of clear responsibility and accountability under sound contracts;
- Elimination of technical transfusion.

Evolutionary changes in the major system acquisition process have been regularly occurring. Now A–109 improves the front end of that process and gives the system acquisition process a better chance to perform effectively, but it does not fully address the basic R. & D. problem, that is the research that must be done well in advance of the time that we can see an application.

A basic premise of the circular is that the entry path for industry into the acquisition process should be a "good idea," plus the capability and determination to pursue the new idea. The quality of the innovative approach is what counts, not large staffs or elaborate plant and equipment.

There are several barriers to innovation that should be fully understood because they can effectively stifle innovation and creativity by providing negative incentives. One of the most serious problems is technical transfusion.

The Technical Transfusion Problem

A government program manager may have a short-term incentive to put together the best features from each competitor's proposal to create the ultimate system. In the long run, however, unfair transfusion of technical ideas between competitors inevitably kills incentive, stifles creativity, and destroys competition. Even in the short run "technical transfusion" can create subsystem interface problems and undermine system integration, producing contractual nightmares.

Many contractors have voiced their concern that technical innovations in which they have invested money and talent will be passed to another contractor during the subsequent "Exploration of Alternative Systems" phase. In extreme cases companies have withheld innovative solutions where suspicion existed that the government agency would unfairly transfuse their approach to a competitor. FPR 1–4.109 addresses this issue, and states that you must have the contractor's permission to use or reveal to others his proprietary information.

It is important that technical transfusion be eliminated in practice as well as policy. It is the deadly enemy of originality. It encourages the well-entrenched to cling to the status quo, resisting basic improvements until forced to do so.

Promoting New Technology and Increased Productivity

A second barrier to overcome concerns practical ways of raising systems performance and manufacturing productivity by encouraging industry innovations in new materials and processes and modern facilities. New technology exists in industry which for one reason or another is not being offered to, or properly solicited by, government agencies. There is fear by industry that government will claim ownership of proprietary technical positions or transfuse them to competitors. There is fear by government that advanced technology leads to more complex, higher cost, and less reliable systems. On the contrary, new technology and increased productivity can be applied to simplify, to reduce acquisition and operating costs, to improve performance, and to achieve greater reliability.

Other Threats to Innovation

Industry is reluctant to invest in new approaches because of the risk that the product won't find a mission in the force structure. Early Mission Needs Statements can be valuable in establishing long-term directions which encourage technical innovation, challenge industry to find innovation approaches, allow time for new ideas to be explored, and then carry the right system through production.

Another major roadblock to innovative contributions by industry is the threat of overregulation and legal harassment. The current horrible example is the dissipation of our nation's world leadership in the nuclear power industry, while U.S. petroleum imports soar and the President calls for an "all-out campaign" for new energy sources.

Karl Cohen recalled during the International Scientific Forum of an Acceptable World Energy Future that construction of the first of three reactors at Hanford, Wash. began in August 1943—just 8 months after Fermi's demonstration of the first manmade chain reaction and only 5 months after acquisition of the site. By the end of January 1945, all three reactors were in full operation and the first plutonium was produced. He noted that in the same period of time—18 months—today, "one might at best hope to have an Environmental Impact Statement completed."

Industry obviously has a strong motive to invest its I. R. & D. money in those new developments which will lead to systems the Government will buy. They recover their investment from successful developments that result in production contracts. These contracts in turn support new I. R. & D. investments by the production contract winners—a sound Darwinian selection process. It is up to industry to select the winning I. R. & D. investments. This requires perception of future environments, changing customer needs, potential technological advances, careful attention to costs, and the synthesis of the new systems that will become tomorrow's production procurements.

Another roadblock to the innovative infusion of new technology is the piecemeal involvement by industry in basic government-sponsored R. & D. and an inadequate forum for the level of dialogue needed by companies to fully understand new system needs and characteristics. In extreme cases government laboratories have reserved this domain as their private preserve—relegating industry to the fringes. The result is technical stagnation, with the "party line" the only acceptable position when new ideas—or even the failures of old ideas—are discussed.

A–109 will help here because it continues the partnership relation between industry and government laboratories, federal contract research centers, and other nonprofit organizations, but constrains government laboratories from "grading their own papers" in technical selections involving their pet system or subsystem applications. This is a healthy clarification of roles, but in practice much still remains to be done.

The policy of A–109 which demands early exploration of alternative approaches and encourages the trial of new ideas—even though some will fail—is a refreshing concept. This facilitates appropriate departures from the tried and true and provides for some failures of innovative alternatives at the least costly point in the development cycle—when parallel approaches can readily be substituted.

RECOMMENDATION

No. 5. The President should issue a clear directive that the reforms in OMB Circular A–109 be applied as soon as possible throughout all Federal agencies, and that OFPP be strengthened and its life extended beyond September 1979 to monitor this.

Government officials should be encouraged to stimulate innovation. They should realize that if all the government's procurement agencies take only low-risk approaches, the United States will be in serious trouble. Without the more risky research and development work, we will have no innovations.

RECOMMENDATION

No. 6. One official should be designated for acquisition in each agency in the same manner as is presently being done in the Department of Defense.

As a matter of principle, the committee believes these officials should have published in all Requests for Proposals (RFP's) the criteria which will be used to measure proposals. Also, the committee believes they should have candid debriefings on the proposals. With this open and honest approach, industry would be more aware of government needs and priorities and, thus, better prepared to fulfill them.

V. STRENGTHENING INDEPENDENT RESEARCH & DEVELOPMENT (I. R. & D.) BY FEDERAL CONTRACTORS

"Independent Research and Development" (I. R. & D.) is the term used by the Government to describe that technical effort undertaken and directed by a company on its own initiative to develop technology and products which, in its judgment, represent the "best fit" between its current technological capabilities and the anticipated requirements of its customers. I. R. & D. is defined as the technical effort initiated and directed by a government contractor, where the work is not sponsored by or required in performance of a contract or grant. It includes the full spectrum of R. & D. effort from basic research through development, and encompasses system and concept formulation studies. The concept of I. R. & D. recognizes that decentralized R. & D. is an inherent part of doing business in today's technical world.

I. R. & D. has as its primary characteristic the stimulation of new ideas and competitive concepts for advancing technology and applying it to the solution of current and future problems. It is the first major step in the innovative process.

Essentially all companies perform I. R. & D. whether or not they do business with the Government. A small portion of the price of every new car, TV set, or bar of soap, is used by the manufacturer to support its I. R. & D. program.

Companies engage in I. R. &D. because:

- They must maintain a competitive level of awareness of new knowledge in chosen fields of technical activity.
- Technological awareness "provides a reasonable basis for acceptance of the technical risks involved in seeking and accepting work characteristic of the industry."
- For an innovative company to compete in a business which depends heavily on technical innovations, it must develop a pool of new technology and "know-how" from I. R. & D.

Each company is highly motivated to manage expenditures for I. R. & D. carefully, since too little or too much can be disastrous in the marketplace, and wrongly directed I. R. & D. gives an edge to competitors. Excessive and/or unreasonable I. R. & D. expenditures result in noncompetitive prices, while inadequate I. R. & D. effort leads to weakness in the competitive struggle.

I. R. & D. which does not result in eventual production contracts does not regenerate I. R. & D. funds for the future: a desirable Darwinian selection process. Only those companies which exercise sound business and technical judgment survive in this competitive environment. Each company must carefully evaluate its I. R. & D. program against its own business objectives, while being careful not to stifle innovation on the part of its scientists and engineers. Progress toward established goals is carefully monitored on a regular basis and progress of projects adjusted accordingly.

The key words in distinguishing the nature and value of I. R. & D. from customer funded R. & D. is "contractor initiated" and, synonymously, "independent." It means that the company's management has the right and the independence to evaluate what it must do to remain technologically competitive in the future, balanced against the competitive implications of the cost of doing so. Because of the vital nature of I. R. & D. to a company's future, this is the most significant decision of management in any enterprise. Independence of judgment in the choice of I. R. & D. is perhaps the most valuable element of I. R. & D., both to the company and to the customer. It permits a company to apply its resources to those technologies and programs in which its capabilities are the greatest and which, therefore, will be of greatest benefit to the customer. It provides the Nation with the critical value of decentralized decisionmaking in innovation.

The company's independence provides benefits that cannot be achieved with central control of research and development. The scientist and engineer at the bench working with company management is in the best position to evaluate their new ideas and projects, which may be at too early a stage, or involve too great a risk, to justify to a government accountant. When I. R. & D. projects are judged not to be fruitful they can be redirected or stopped locally. It is this independence and decentralization of technical decisionmaking that is vital to a company's flexibility in positioning itself to compete successfully for future business that meets new government needs. This independence produces a creative environment which leads to feasible solutions to new problems and quickly translates new ideas into practical applications.

In summary, decentralized I. R. & D. is a major source of innovation contributions to the nation's technological base. The greatest single benefit to be derived from strong industrial I. R. & D. is the assurance of a technologically superior industrial base which is flexibly applied to meet future needs through advanced products and services.

I. R. & D. is an integral element of the technical marketplace. It has particular importance in the high-technology government business arena for companies working for DOD, NASA, DOE, etc. Here, I. R. & D. represents a key element in connecting the needs and functional requirements expressed by forward-looking agencies with potential innovative solutions conceived by the thousands of scientists and engineers engaged in industry's I. R. & D. programs. The many ways in which industrial I. R. & D. contributes to national goals and objectives can be summarized as follows.

1. PROVIDES MAJOR CONTRIBUTIONS TO NATION'S TECHNOLOGICAL BASE AND AVOIDANCE OF "TECHNICAL SURPRISE"

I. R. & D. is a major source of innovative contributions to the nation's technological base, available for rapid application to meet new mission needs. A pool of available technical capabilities is developed by *not* rigidly specifying all of the nation's government-oriented R. & D. as part of the engineering definition of major systems and hardware developments sponsored by DOD RDT&E funding. Excellent examples of the flexibility made possible by developing these pools of available technology are the rapid development of the Manhattan Project during World War II based on nuclear science developed in the 1930's, and the rapid development of the Polaris submarine by the combination of solid rocket technology, inertial guidance, and underwater nuclear propulsion.

The greatest single benefit to be derived by all customers, including the Government, from a strong industrial I. R. & D. effort is the assurance of a superior industrial technology base and innovation source for future government needs.

The intrinsic ability of decentralized I. R. & D. to spur the application of highly advanced technology to recognized national needs and requirements by thousands of scientists and engineers in industry, is an invaluable contribution to future innovation and to the avoidance of "technical surprise" by competing nations or potential aggressors. Examples of past surprises include the impact of "Sputnik" on the United States, the solid-state watch on Swiss watchmakers, and code breaking on Japan's World War II campaigns.

2. STIMULATES COMPETITION AND CREATES TECHNICAL ALTERNATIVES AND QUICK REACTION TO GOVERNMENT REQUIREMENTS

I. R. & D. stimulates the three interrelated aspects of competition: performance, cost, and schedule competition. By providing a mechanism for companies to explore their individual approaches to solving known, longer range government requirements, it ensures the timely availability of alternate technical solutions and the existence of meaningful performance and cost competition.

By encouraging the application of advanced technology to simplify existing designs and conventional production processes, I. R. & D. stimulates cost competition. Stated in another way, I. R. & D. provides the ability for a contractor's "bottom-up" flow of ideas and possibilities to temper the customer's "top-down" mandated end item performance and system characteristics, and to evolve a more cost-effective solution. By providing early testing of new ideas, it provides the needed confidence in innovative approaches. This is a significant factor in maintaining U.S. leadership in science and technology, and the resultant lead time upon which our world preeminence depends.

3. PROVIDES MORE TECHNOLOGY FOR THE DOLLAR

I. R. & D. programs have minimal administrative cost, since their in-house management eliminates the need to add the complex administrative overlay required to furnish formalized financial data and technical reporting attendant to contract R. & D. In this way, I. R. & D. maximizes the technical effort accomplished for the funds expended.

4. PROVIDES QUICK REACTION AND FLEXIBILITY

I. R. & D. work can be quickly initiated, terminated, or redirected locally in response to technological findings, changes in the external technological environment, or new customer needs. Decentralized management decisions on corporate I. R. & D. are unencumbered by the formality and procedural constraints surrounding contract R. & D.

5. STIMULATES CREATIVITY

I. R. & D. is an important contributor to building and sustaining within a company a "climate" which encourages innovative thinking and risk taking. The contractor's I. R. & D. programs attract and hold innovative individuals because they support the exploration of good ideas and their pursuit to logical conclusions without the delays inherent in securing additional contract funding or customer agreement to redirect a contracted effort.

6. TAKES MAXIMUM ADVANTAGE OF INDUSTRY'S BUSINESS AND MANAGEMENT APPROACH

I. R. & D. takes maximum advantage of industry's "applications" orientation; i.e., it effectively picks the brains of thousands of scientists and engineers and screens the resulting ideas through a critical, informed industry-management view of what constitutes an eventual, producible, salable end-item. I. R. & D. also benefits by its susceptibility to management financial and performance control by management systems that are already in place for the normal conduct of company business.

7. REDUCES RISKS AND PROVIDES RESPONSIVENESS TO ACQUISITION PROCESS

The demonstration of the feasibility of a high-risk but potentially superior solution to a known need is usually accomplished by I. R. & D., which provides the mechanism for rapid evaluation by industry of newly identified critical deficiencies affecting customer programs. The contractor management decision process is measured in days whereas the customer procurement cycle requires weeks or months. On occasion, contractors have recognized government needs, and have had solutions for a critical deficiency prior to its formal recognition by the Government. As a result, solutions ultimately proposed for government contracts have reduced technical risk, and saved time and money.

Additionally, in recent years, the government's acquisition process has shifted demonstrably in the direction of requiring bidders to demonstrate in their proposals a high degree of understanding of the related problems, and to offer high-confidence solutions (as distinct from being funded to investigate, identify the nature of, and solve these problems). This can only be done if innovative solutions are based upon the results from a sound I. R. & D. program.

8. GENERATES STUDIES AND SYSTEM CONCEPTS SUPPLEMENTING GOVERNMENT PLANNING

This product of I. R. & D., representing industry's views of alternative approaches to satisfy customer needs, complements the government's in-house activities which define and refine its requirements. Many unsolicited proposals for resolving critical deficiencies or for effecting significant cost reductions have resulted from these studies. The innovative response to formal RFP's also benefits from timely company-conducted system studies.

BID AND PROPOSAL (B&P)

Any discussion of I. R. & D. effort conducted by companies engaged in government contracts involves reference to a related but different activity described as Bid and Proposal (B&P).

Bid and Proposal is a term used by Federal agencies to describe a contractor's technical and supporting effort directed at preparing and submitting proposals (solicited or unsolicited) to customers to meet identified customer requirements.

A bid or proposal is an offer to the customer either at his request or on an unsolicited basis. The word "bid" is generally used in connection with the quotation of prices on work specifications furnished by the Government under formal advertising procedures. "Proposals" are submitted for use in negotiated procurement, when the specifications are inadequate for formal advertising, and will include the company's technical and cost offer and plans for undertaking the desired work.

B&P efforts differ from I. R. & D. in that B&P is the activity undertaken by a company to respond to specific government requirements by the application of its particular technological expertise. Preparation of proposals, whether solicited by the Government or unsolicited, involves major technical effort on the part of a company in setting forth to the procuring agency or customer the details, feasibility and superiority of its proposed approach. The Government encourages lively competition among private companies which can only be effective if companies are in a position to respond with vigorous B&P activity. Competition is encouraged not only on standard products (catalog items) and price proposals (build to print, or production programs), but also on cost-reimbursement type contracts where tech-

Bid and Proposal is a term used by Federal agencies

nical approach, cost, schedule, performance, and contract terms and conditions are all factors.

B&P costs are incurred in preparing, submitting and supporting bids and proposals, whether these proposals are directed toward government or nongovernment contracts and whether they are successful or not.

In the major government agency system procurement process (e.g., DOD and NASA), before A–109's implementation, contracts were not awarded solely on the basis of a company's cost proposal and demonstration of resources to be applied to a contract, coupled with prior accomplishments. Rather, the company's proposal had to demonstrate a complete understanding of all technical problems, to the point of describing therein a substantially finished design of a viable version of the system to be furnished, with a competent discussion of the merits of the chosen design versus possible alternatives. The associated technical effort, ranging from studies, computer modeling and design calculations to, in many cases, the construction of prototypes, represents the technical effort required for B&P.

Thus, two types of effort are performed with B&P funds. First, there is administrative effort directed toward physically preparing the proposal document and assembling the cost and other administrative data necessary to support the proposal. Second, there is the technical effort which is undertaken specifically to support a contractor's bid or proposal. On proposals relating to advanced weapons and space systems, this technical effort represents the major portion of the total B&P costs.

The major difference between B&P and I. R. & D. technical effort is the presence or lack of intent to use the results directly for preparing a specific bid or proposal. I. R. & D. precedes the related B&P; it is a longer range effort, generally broader in scope, and intended to lead to unspecified future business. B&P effort involves the combining of the technical effort begun under I. R. & D. with additional information into a form suitable for a specific identifiable proposal or competitive bid.

While there is much B&P technical effort involved in the preparation of complex proposals for major government programs, the nature of this effort is specifically directed toward the technical requirements spelled out in detail in the request for proposal. This effort is primarily involved in the application of a company's technical capability and expertise to the problem at hand. There is insufficient time for additional exploratory I. R. & D. efforts after receipt of the RFP. The knowledge acquired from past I. R. & D. efforts must then be applied to the technical effort necessary to respond to the proposal, which is often the best indicator of the quality and relevance of the prior I. R. & D. work. Thus, it is evident that while both I. R. & D. and B&P involve technical effort by scientists and engineers, they are really two distinctly different activities, directed toward different objectives, in different time phases. I. R. & D. explores the future, sometimes seeking knowledge for knowledge's sake or seeking a better answer to problems or exploring better ways to perform a function. In contrast, B&P defines a present capability, describing clearly and concisely in a formal proposal a solution to a specific customer problem or requirement that is reasonably well understood and tested, or an approach to a solution that has a very high probability of success (often demonstrated in preliminary form as a result of previous I. R. & D.). I. R. & D. and B&P should be treated the same in cost accounting, as they are now.

THE PROBLEM OF I. R. & D. AND B&P

In past years, DOD has been the agency with the largest procurement of major systems, goods and services from industry. In cases involving competitively awarded firm-fixed-price contracts, DOD has no need or requirement to analyze the many elements of cost making up the contractor's prices, since the price competition assures the reasonableness of all cost elements, including I. R. & D.

For negotiated contracts, however, and especially cost reimbursable contracts, there is a basic dilemma involving DOD's need to ". . . stimulate innovation in an unconstrained fashion and obtain a reasonable assurance that tax dollars thus spent result in effort of broad national value as opposed to undue enrichment." (Commission on Government Procurement, Vol. 2, p. 40).

The view that competitive pressures were absent in cost-type contracts was held to require that additional control and negotiation of I. R. & D. expenditures was necessary. (This view ignores the fact that excessive or unreasonable expenditures for I. R. & D. reflect in higher overhead rates, which must also be used in competitive bidding for new or follow-on government business). Accordingly, an increasing degree of control of I. R. & D. effort has evolved over the years, culminating in Public Law 91–441, Section 203, which requires, among other things, that DOD:

- Not pay contractors for I. R. & D. or B&P costs unless the work has, in the opinion of the Secretary of Defense, a potential relationship to a military function or operation.
- Negotiate advance agreements to establish dollar ceiling with all companies that received more than $2 million in I. R. & D. or B&P payments from DOD in the preceding year, and
- Base the I. R. & D. portion of the agreement on company plans that are technically evaluated by DOD before or during the fiscal year covered by the agreements.

While this legislation does not apply to NASA, this agency uses a similar procedure, differing only in the absence of a potential relationship.

While U.S. military strategy is based upon continuing U.S. preeminence in science and technology, with a resultant 5–10-year lead time in technical performance, the DOD is put in the position of negotiating U.S. defense R. & D. downward. In addition, while Congress repeatedly exhorts prompt and massive application of the skills and innovations of its defense and space contractors to the solution of urgent problems in civilian agency sectors, such as energy or pollution control, it has promulgated legislation that inhibits these contrac-

tors in pursuing necessary precursor work to this end. Furthermore the erroneous implication that all possible applications of advanced technology can be foreseen by DOD and that its potential use to any given government agency can be preassessed ignores well-known examples ranging from lasers to reconnaissance satellites. It also ignores the purely financial benefits that can redound to all customers, including government agencies, via reduced overhead rates if the business base of a company's cost center can be enlarged through research by acquisition of additional business from other government agencies or other new customers. Worst of all, it substitutes unwarranted centralized control of innovative efforts for the decentralized risk taking and reward seeking so essential for lively creativity in a competitive environment.

RECOMMENDATION

No. 7. Recognize OFPP's views that I. R. & D. is an ordinary cost of doing business and remove the requirement for Potential Military Relationship (PMR) of I. R. & D. associated with DOD contracts. Let the competitive marketplace judge the technical quality and relevance of competitive I. R. & D. programs.

The commission on government procurement made the following recommendation, which is supported by OFPP, to provide a uniform government-wide cost principle for I. R. & D. as well as B&P. The committee endorses this recommendation.

RECOMMENDATION

Recognize in cost allowability principles that independent research and development (I. R. & D.) and bid and proposal (B&P) expenditures are in the nation's best interests to promote competition (both domestically and internationally), to advance technology, and to foster economic growth. Establish a policy recognizing I. R. & D. and B&P efforts as necessary costs of doing business and provide that I. R. & D. and B&P should receive uniform treatment, government-wide with exceptions treated by the Office of Federal Procurement Policy.

Since negotiated advanced dollar ceilings for I. R. & D. and B&P are heavily leveraged in the government's favor, the negotiated ceilings are lower than a company's proposed I. R. & D. program. The cost to a company of expenditures over ceiling has been approximately doubled by a concomitant requirement to burden (i.e., add overhead to) I. R. & D. costs.

There is no legal requirement for a company to spend in excess of the negotiated ceilings, but in practice its following year negotiated ceilings would undoubtedly be decreased if a contractor were to elect to reduce the scope of its I. R. & D. program to conform to the dollar ceiling negotiated. Thus, the Government does not accept its full allowable share, and introduces harmful uncertainty into the decision process through the negotiations.

Valid, real competitive pressures do exist in cost-type negotiated contracts to prevent excessive expenditures for I. R. & D./B&P. Additionally, the experience compiled during several years of the current procedures provides excellent and adequate data on which to base a *test of reasonableness* (used for evaluation of virtually all other indirect costs of government contractors), rather than negotiated ceilings.

RECOMMENDATION

No. 8. Eliminate negotiated dollar ceilings for I. R. & D. and B&P costs, substituting the criterion of reasonableness, and eliminate burdening of I. R. & D. and B&P costs.

Technical evaluation of contractors' I. R. & D. programs requires the submittal of extensive, highly detailed technical plans and description of prior year progress for review by government evaluators. Preparation of the associated narrative material requires significant time of the associated scientists and engineers, far in excess of that required for firsthand review by a company's local technical management.

These evaluations are being translated into technical ratings which form one of the bases for the negotiation of the dollar ceiling. They represent government representatives' opinions of the technical effort, which opinions should have no bearing on the amount of dollars spent by a company for I. R. & D., if I. R. & D. is truly independent. Even more important, many of these opinions inhibit innovations because high technical ratings are provided only for the technical effort which appears to fit the present mission of the agency, but such opinions do not rate highly technical efforts which presently do not fit the mission, but which in the future may provide a real alternative.

RECOMMENDATION

No. 9. Deemphasize the practice of technical evaluation of industrial I. R. & D. programs by government agencies.

There is a problem in a small company's attempt to secure government contracts for its innovation work. Small innovative companies traditionally spend a significantly higher portion of their sales dollars for I. R. & D. alone, often 10 percent or higher. Annually, published data for major defense contractors show that I. R. & D. and B&P costs allowed total some 3.5 percent of the associated sales to DOD. Depending on the agency policy, I. R. & D. and B&P, (a) is not allowed, (b) is allowed only to the extent set forth in a contract line item, or (c) in accordance with a set formula. As an example, companies not meeting the threshold criteria of section 103 Public Law 91–441 do not negotiate advanced agreements with DOD because their I. R. & D. and B&P costs are evaluated on a formula basis involving prior year levels for such costs. This can present a problem for new companies with little or no history of sales prior to seeking the government business. Some eligibility criterion does appear to be necessary for the Government to assist the entry of such companies.

RECOMMENDATION

No. 10. Develop a program under the leadership of the National Science Foundation (NSF) to increase the support of innovative programs of national interest by small companies, and the testing of their innovative products and concepts.

VI. PROTECTION OF FEDERAL CONTRACTORS' PATENTS AND PROPRIETARY DATA

PATENTS

In certain parts of our Government, a great deal of effort and money is expended for the encouragement of innovative ideas and their patenting status. The National Science Foundation (NSF) has made detailed studies costing millions of dollars to ascertain the causes of innovation and incentives, including the proper handling of patents, both in and out of the Government.

However, the practices of some government agencies tend to depreciate the value of patents to owners of a proposed item. Furthermore, the lengthy time required in today's high technology environment and the delays inherent under regulatory reviews further lessen the value of patents.

As a practical matter, so much time can be required to get government acceptance of an unsolicited proposal (this includes its evaluation, contract award, and subsequent repeats of the above process until production can result) that the life of the patent (17 years) may well have expired. Thus, the term of a patent is now often too short to provide financial protection and a reasonable return for investment in innovation. It is extremely unlikely that a basic patent on a process invented today for practical fusion energy could collect royalties within the next 17 years, for example, in view of the long time between invention and final commercial application in this area.

RECOMMENDATION

No. 11. The Department of Commerce, with the cooperation of the National Academy of Engineering (NAE) should review the time versus return on patents to see whether the incentive for innovation would be significantly increased by extending the life of patents from 17 to 25 years.

It is becoming quite evident that existing Federal policies regulating the allocation of rights to inventions resulting from government-sponsored contracts fail to stimulate industrial creativity, innovation and technical growth. Quite the contrary, current agency policies appear to delay, and even discourage, commercial disclosure and utilization of such inventions, thereby depriving the American consumer of the benefits of the enormous annual national investment in technology development. The United States must be able to take advantage of the technology that is being developed using government funds and apply it to an area of the economy. It is important that full advantage is taken of the nation's investments so that the national technological lead is maintained in the world and that innovative ideas and technology are stimulated.

At the present, Federal agencies are operating under different policies respecting ownership of government-sponsored innovations and inventions. In short, there is no uniform government policy for determining the allocation of rights in the fruits of government-funded research and development. The problem urgently needs a legislative solution.

This Committee therefore urges the enactment of legislation providing a uniform government patent policy under which normally a contractor, should he so elect, would retain title to each invention conceived or first actually reduced to practice in the course of development under a government research and development contract. The right to patent title would be subject to certain rights by the Government. The Government could require the contractor to grant a license to a responsible applicant upon reasonable terms and conditions, or, if the contractor refuses, to grant such a license itself provided the Government action is taken only after public notice and an opportunity for hearing and judicial review.

Under such a policy, a system for the effective management and utilization of the innovations and inventions derived from Federal R. & D. contracts can readily be established, based on objectives designed to promote commercial utilization, uniformity, and administrative efficiency, while fully protecting the interests of the Government as well as the general public.

RECOMMENDATION

No. 12. The Department of Commerce should be given the responsibility, in consultation with other agencies and NAE, to develop a uniform policy applicable to all departments of government, transferring the patent rights on the results of government-sponsored research to the private sector for commercialization. The Government would retain a nonexclusive license to use and have made for its use inventions founded in whole or in part by governmental expense.

The problem of acquiring concurrent foreign patents so that the inventor has worldwide protection for his ideas is a very complex problem. Large companies can afford to apply for this protection on a country by country basis but small companies do not have adequate resources to do this. Consequently, innovative work done in small companies many times is only protected in the United States.

United States law provides that foreign patents can be applied for and issued in the United States without further cost or fees. These same rules do not apply in foreign countries.

RECOMMENDATION

No. 13. The Government should negotiate reciprocity agreements with foreign countries, or require equivalent filing and annual fees for U.S. patent registration for those countries which will not agree to reciprocity.

PROPRIETARY DATA

Companies which perform Independent Research and Development (I. R. & D.) are important to the

United States' economy. The innovations which result from I. R. & D. are reflected in inventions and proprietary data. Proprietary data is defined as technical data developed at private expense and retained in confidence or released only on a restricted basis by a company. It is the means by which a company has a record which enables it to reproduce the results of the I. R. & D. Therefore, in order to maintain its competitive position, the company seeks to prevent its disclosure to its competitors.

Proprietary data is a valuable asset and is protectable under law. It must not be made available to the public or to competitors when in the hands of government agencies through the Freedom of Information Act. Agencies must be held accountable for seeing that such data is appropriately safeguarded; any limitations on its use by the Government or others should be scrupulously observed.

Some Federal agencies overreach to obtain proprietary data from companies without compensation, while others do not properly recognize or observe the limitations placed on its use. To the extent that a Federal agency has an absolute need to acquire a company's proprietary data, the acquisition should be by separate negotiation and the owner should receive fair compensation. This is essential if innovation is to be encouraged.

Federal policies and practices which seek, without prior determination of a specific government need, to acquire proprietary data from its owner fail to safeguard such data in the hands of the Government, expose the rights in proprietary data to loss or dilution, and unnecessarily increase costs to the Government. There is no readily available remedy whereby an owner of proprietary data may be compensated for its improper use by the Government.

Industry has been and continues to be concerned over the growing multiplicity of policies and implementing regulations issued by Federal agencies governing rights in data acquired by the Government under Federal contracts. For example, under current regulations the same item of proprietary data of a contractor must be marked as "limited rights data," "protectable data," or "proprietary data" depending upon whether the contractor is dealing with the Department of Defense, National Aeronautics and Space Administration, or Department of Energy. These significantly different policies and regulations result in placing administrative burdens upon contractors and tend to place valuable proprietary data in jeopardy because it is prohibitively expensive for a contractor to establish a system to identify and protect rights in data in accordance with the different definitions promulgated by the different Federal agencies.

RECOMMENDATION

No. 14. The OFPP, in consultation with other agencies of government, should develop and promulgate a uniform "policy statement" such as the proposed policy which follows. This proposal sets forth the respective rights of the Government and the contractor in the technical data first produced under a contract and in proprietary data used in the performance of a government contract. This should include a section specifying that a contractor will be provided appropriate compensation for the loss of rights in data through improper or unauthorized use of disclosure of proprietary data by the Government.

PROPOSED RIGHTS IN TECHNICAL DATA POLICY FOR FEDERAL AGENCIES

This statement of Federal policy concerns the allocation of rights to technical data originated by a contractor in the performance of a government contract, and the preservation to a contractor of rights in proprietary data used in the performance of a government contract.

Congress, the courts and the Federal agencies have each recognized the economic value of privately developed data to its owner and the need to protect such data from unauthorized use or disclosure. It is in the interest of the Government and the public to encourage prospective contractors to invest talent and resources to provide new and improved products or services in meeting the needs of the Government and the public. An effective way for the Government to encourage such investments and to obtain these benefits is to assure that the rights of the originator of technology generated by such efforts and expense are respected.

Definitions

1. Appendix "A" sets forth the definitions of certain terms used herein.

Rules and Regulations

2. The President shall cause to be issued rules and regulations, which shall be uniform throughout the Federal agencies, to carry out and effectuate the provisions of this policy.

Government Rights in Technical Data Involved in the Performance of a Contract

3.a The acquisition, maintenance, storage, retrieval, and distribution of technical data, including privately developed technical data, is costly and burdensome; therefore government agencies are directed to acquire only such technical data and rights therein as are essential to meet their specifically identified needs.

3.b Each government agency shall normally acquire on behalf of the United States, at the time of entering into a contract the performance of which will generate, or involve the acquisition of, technical data, unlimited rights to use, duplicate, or disclose in whole or in part, in any manner and for any government purpose whatsoever, and to have or permit others to do so in the following categories of technical data:

(a) technical data originated in the performance of research or development work specified as an element of performance in a Government contract or subcontract.

(b) technical data prepared or required to be delivered under the Government contract and constituting corrections or changes to Government furnished data;

of proprietary data may be compensated for its im-

(c) technical data pertaining to end-items, components or processes, required to be delivered under the Government contract or subcontract for the purpose of identifying sources, size, configuration, mating and attachment characteristics, functional characteristics and performance requirements ("form, fit and function" data, e.g. specification control drawings, catalog sheets, envelope drawings, etc.);

(d) manuals or instructional materials prepared or required to be delivered under the Government contract or subcontract for installation, operation, maintenance or training purposes;

(e) technical data which is in the public domain, or has been or is normally furnished by the contractor for subcontractor without restriction;

3.c When a government agency enters into a contract which requires the furnishing of privately developed technical data as to which the Government acquires only limited use rights, such data shall not be:

(1) released or disclosed in whole or in part outside the Government,

(2) used in whole, in part, or in any manner by the Government for manufacture or for procurement by or for the Government; but may be:

(i) used for emergency repair or overhaul work only, by or for the Government, where the item, process or service concerned is not otherwise reasonably available from the contractor to enable timely performance of the work, provided that the release or disclosure thereof outside the Government shall be made subject to a prohibition against further use, release or disclosure; or

(ii) disclosed to a foreign government, as the interest of the United States may require, only for information or evaluation within such government or for emergency repair or overhaul work by or for such government under conditions of (i) above.

3.d No government agency approval is necessary for a contractor to use any item, component, or process in the performance of its contract, though the technical data relating thereto would be subject to being furnished with limited rights.

Contractor Rights in Technical Data Originated in the Performance of a Contract

4. The contractor under a government contract shall retain all rights to technical data originated in its performance of work under the contract, subject to those rights granted to the Government or others under the contract.

Contractor and Government Rights in Contractor Privately Developed Technical Data

5.a Unless otherwise expressly provided, the acceptance of a government contract by a contractor does not thereby grant by implication or otherwise any rights in privately developed technical data which the contractor may own or control.

5.b A contractor shall have the right, with respect to privately developed technical data not furnished with unlimited rights, to identify such data as limited rights data, by marking, where feasible under the circumstances, with an appropriate restrictive marking. However, a contractor shall be afforded the opportunity to correct, within a reasonable period of time, the inadvertent omission of a restrictive marking. Further, a contractor shall be permitted as by use of a legend, to express its intent to exempt the limited rights technical data from the Freedom of Information Act.

Patents

6. The furnishing of technical data to the Government in connection with the performance of work under a government contract does not constitute a license to the Government by implication or otherwise under any patent.

Fair Compensation

7. When an identified and absolute government need for proprietary data is established, the Government may acquire such data by the payment of fair compensation for the value of such data, only through negotiations which are separate from negotiations under a contract, with the limitation of the government's right to use limited to the specifically identified need.

VII. INCREASING BASIC R.&D. IN UNIVERSITIES, GOVERNMENT LABORATORIES AND INDUSTRY IN SUPPORT OF INDUSTRIAL INNOVATION

Innovation, as the committee has defined it, is the whole process—from idea generation through research and development to production and introduction to the market.

It is the main goal of industry. However, it is not the goal of university or government in-house laboratories. These, by their very nature, have a vested interest only in the creation and investigation phases of the innovation stream.

This is as it should be, for this is a critical part of the process. Research should be considered the seed which will take root and grow into new technological advancements and new and improved products which create better living conditions.

Today, unfortunately, both public and private enterprise in the United States is spending relatively less on research and development. We are living increasingly on our intellectual capital accumulated in previous decades.

Although the level of U.S. expenditures for research and development has increased steadily during the past two decades, the rate of growth has slowed. Combined

government and private expenditures for these purposes rose an average rate of 7 percent annually in the sixties and slackened to an annual growth rate of 6.7 percent in the seventies. Expenditures in Japan, France, Canada, and West Germany have risen faster than in the United States. Soviet expenditures on space are probably twice NASA's dwindling budget.

The United States' R. & D. expenditures have represented a declining share of the gross national product since the midsixties. The share reached a peak of 2.97 percent in 1964—far ahead of other countries. But by 1977, it was down to 2.15 percent. The United States Government's contribution to the nation's R. & D. expenditures also decreased from 65 percent in 1960 to 53 percent in 1976. If government R. & D. policies are going to be improved to aid industrial innovation, they will have the most leverage in the early stages of "research," and very little effect after the "development" phase.

In industry, there is eager acceptance of new and different ideas in the early conceptual stages of research, but there is little acceptance in the final design stage, after the business decisions have been made. The exchange of technical information is easy and generally open in the beginning stage because the researcher wants to consider every possible option. But, as the work moves closer to actual production, proprietary knowledge increases and outside communication is reduced. By now, most of the basic technological directions are established, and concentrated high investment is required.

GOVERNMENT IN-HOUSE LABORATORIES

Some critics contend that, by absorbing government funding for their activities, university and government in-house laboratories take support away from the industry whose vested interest is consistent with the process of innovation. This will not occur if the provisions of the revised OMB circular A–76 are followed with the appointment of a responsible acquisition executive within each agency. This policy requires more effective implementation throughout government. Agencies should follow the lead of DOD in appointing an acquisition executive able to implement and scrupulously observe its "make or buy" policies in R. & D. procurement versus in-house laboratories.

In-house laboratories are essential. These laboratories take on jobs full of technical risks which industry would not touch. University and government laboratories do not have the same return on investment concerns which influence the industrial sector and they are prepared to operate on a longer time scale. Furthermore the research capability which government laboratories contribute to their agencies is essential for the effective management of contracted R. & D. and future program direction.

Often, a long time is required before basic research work can be translated into product design. One example is a project dealing with the extraction of geothermal energy from hot rock buried deep in the earth. The technical risks are enormous and no one knows when a solution will be found. Nevertheless, related work—which is so important to our energy-short economy—is being done at the Los Alamos Laboratory, which is extending the frontiers of deep-drilling technology.

Going even further, government laboratories often take on projects which are never meant to lead to production but which answer questions of great importance in the continuing flow of new technology. Some examples of this are measurements of scattering cross sections of radar and sonar targets, atmospheric attenuations, new computer language developments, and even choices between computer architecture. One other criticism of these laboratories is that they tend to delay, and even obstruct, the movement to product design and production. But this really deals with an abuse of the direction of the government laboratories rather than with the laboratories themselves.

Government laboratories vary from one extreme to the other. At one weapons development facility, the goal seems to be to carry its work from the initial idea stage right on through full scale development, bringing industry in at the end of the process. But another similar facility does only the conceptual work and provides test ranges to private industry which is contracted with for the actual development.

GOVERNMENT SUPPORT OF UNIVERSITY TECHNOLOGY

The procurement of R. & D. from universities by the Government also requires reform. Anyone who was associated with university science in the late forties and fifties remembers with nostalgia the Office of Naval Research (ONR) grants which universities received. These grants led to major scientific advances in physics and chemistry, fueling much of the innovation which the country accomplished in that period and training many of today's technical leaders.

That intelligent ONR program was replaced by a program of grants sponsored by the National Science Foundation (NSF) and various other government laboratories which have not been nearly as effective as was ONR in supporting academic research.

The ONR grants were aimed at supporting basic academic research in reputable universities and were not justified on any other grounds. NSF, NIH (National Institutes of Health), and other such grants, while still *aimed* at basic research, must be justified in terms of relevancy to specific identifiable problems, such as cancer cures and the like. This centralization of technical decisionmaking is inimical to innovation and in contrast to ONR's successful decentralized management.

The present system often leads to expertise in the writing of winning proposals rather than in solid technical quality and creativity. As one academic put it, we have promoted "grantmanship." The Government is making the same mistake with universities as it is making with industry when it forces narrow potential military relevance "PMR" criteria on industrial I. R. & D. projects.

This is not to derogate the value of grants from NSF and from the other government foundations. Without them the country's supply of Ph. D's in physics, chemistry, biology, and the like, would dry up even more than is now taking place. But we have retreated from the farsighted vision of the ONR period. NASA's university support program of a decade ago was also more effective than today's system; consideration should be given to its reinstitution through increased budgets.

Excellence in academic research and graduate education is the leading edge of the country's innovation process. We are not getting the boldness or quantity we need under today's level and type of university R. & D. procurement.

RECOMMENDATION

No. 15. A blue ribbon commission should be convened under the leadership of the President's Science Advisor with representatives from NAS, NAE, government laboratories, and Congress to review U.S. university R. & D. and recommend new levels and kinds of support.

Tax incentives that promote a direct link between industrial innovation and the nation's universities also should be explored. Such programs could provide valuable decentralized aid to university R. & D. through tax-deductible industry grants that support younger scientists while they carry out R. & D. within university engineering departments, tackling fundamental problems which are difficult for industry to support alone. This approach would encourage studies of basic problems which would provide nonproprietary research results to industry and education alike. It would give graduate students excellent applied research experience for future work in education, government, or industry, with industry receiving a tax deduction incentive for its support. M.I.T., Harvey Mudd College, and other schools have programs of this kind which could provide prototypes. This approach would provide the decentralized technical decisionmaking essential for lively innovation. This is a proposal for an innovation in Federal and industrial R. & D. procurement through tax incentives and industry participation.

RECOMMENDATION

No. 16. The NSF, with the cooperation of the Treasury, Department of Commerce, NASA, DOD, and NAE, should explore the establishment of a new, decentralized industry-university R. & D. support program oriented toward promoting innovation in universities through tax-deductible industry grants.

VIII. THE USE OF PROCUREMENT TO CREATE MARKETS FOR INNOVATION

The buying power of the Federal Government is a powerful tool which can be intelligently harnessed to provide a stimulus and an incentive for innovation. This buying power is a traditional tool of government for many purposes, from promoting innovation to pressuring the industrial community into social and economic reforms. The standard "boiler plate" of government contract terms and conditions are replete with admonishments and demands for equal opportunity, small business preference, conservation of scarce materials, selective use of government stockpiles, environmental enhancement, employment of women, minority advancement—and a host of other executive and legislative rules and regulations. While many of these special interest rules and demands reflect worthy motives, they are particularly burdensome to the innovative process and introduce great complexities into procurement practices.

Government contracting can be used for more than just disciplining industry. It can be used as a stimulus to innovation, and to provide the economic incentives which are necessary if industry is to assume an innovative posture. Government contracts with early airlines to carry air-mail is an excellent example of early use of this technique to foster innovation through government procurement.

There are several recent examples of Federal procurement being used in an imaginative fashion to stimulate innovation. With the encouragement of NASA, Comsat was incorporated to develop and operate a worldwide communication satellite network. A key event in NASA's stimulation of the communication satellite industry was an early contract for Comsat to provide worldwide communications for NASA's tracking network. This substantial contract commitment helped provide the collateral required to raise the investment capital needed from money markets. Without NASA's contract, which involved some risk, Comsat would not have gotten off to such an early start. A similar opportunity may exist now in space transportation through commercial operation of the space shuttle.

A second example is the willingness of Government to take the lead in solar energy development by contracting for solar installations on government buildings. Solar energy is still more expensive than conventional energy, but this action is a deliberate initial attempt by the Government to stimulate innovation in the infant solar industry.

Another method of stimulating innovation through the procurement process is the "Cooperative Agreement." For example, the DOE has cooperative agreements with industry in waste and heat recovery technology. There are Organic Rankine Cycle (ORC) agreements with Sunstrand and Mechanical Technologies. Further, there is a Coal Liquification agreement with Exxon.

In fact, the Federal Grant and Cooperative Agreement Act of 1977 (Public Law 95-224), signed by President Carter on February 2, 1978, mandates that *all* Federal departments and agencies distinguish between situations where they buy goods and services for their own direct use and where they assist (through funds, goods, and services) non-Federal entities—such

as State and local government and others, such as industry—to undertake work that is judged to be in the public interest. Under certain conditions, the vehicle for the "assistance" mode is the Cooperative Agreement.

The Committee recommends that the Office of Management and Budget (OMB) specifically explore the opportunities for stimulating industrial innovation through such cooperative agreements. It also suggests that the Office for Federal Procurement Policy in OMB be designated as the "Office for Federal Procurement and Assistance Policy" so that full and balanced policy formulation can be undertaken for both procurement and assistance by Federal agencies. In this manner, OMB is more likely to develop imaginative and viable guidelines for all Federal agencies to implement Public Law 95-224. Also, it could monitor its implementation before reporting back to Congress by February 1980, as required under the act.

RECOMMENDATION

No. 17. The President should call on each Federal agency to propose for review by the OMB new Federal procurements and cooperative agreements which would encourage significant industrial innovation in selected areas of importance to the agency's mission. In line with this, the OMB's Office for Federal Procurement Policy should be designated as the "Office for Federal Procurement and Assistance Policy."

APPENDIX

A. *"Statement of Financial Accounting Standards No. 2 Accounting for Research and Development Costs."* (The rigid application of this standard is considered deleterious to the support of innovation.)

B. *OMB Circular A-109.* (The widespread application of this throughout the Government is recommended by the committee.)

APPENDIX A

Statement of Financial Accounting Standards No. 2 Accounting for Research and Development Costs, October 1974.

FINANCIAL ACCOUNTING STANDARDS BOARD
High Ridge Park, Stamford, Connecticut 06905

INTRODUCTION

1. This Statement establishes standards of financial accounting and reporting for research and development cost with the objectives of reducing the number of alternative accounting and reporting practices presently followed and providing useful financial information about research and development costs. This Statement specifies:

(a) Those activities that shall be identified as research and development for financial accounting and reporting purposes.

(b) The elements of costs that shall be identified with research and development activities.

(c) The accounting for research and development costs.

(d) The financial statement disclosures related to research and development costs.

2. Accounting for the costs of research and development activities conducted for others under a contractual arrangement is a part of accounting for contracts in general and is beyond the scope of this Statement. Indirect costs that are specifically reimbursable under the terms of a contract are also excluded from this Statement.

3. This Statement does not apply to activities that are unique to enterprises in the extractive industries, such as prospecting, acquisition of mineral rights, exploration, drilling, mining, and related mineral development. It does apply, however, to research and development activities or enterprises in the extractive industries that are comparable in nature to research and development activities of other enterprises, such as development of processes and techniques including those employed in exploration, drilling, and extraction.

4. *APB Opinion No. 17,* "Intangible Assets," is hereby amended to exclude from its scope those research and development costs encompassed by this statement.

5. Paragraph 13 of *APB Opinion No. 22,* "Disclosure of Accounting Policies," is amended to delete "research and development costs (including basis for amortization)" as an example of disclosure "commonly required" with respect to accounting policies.

6. Standards of financial accounting and reporting for research and development costs are set forth in paragraphs 7–16. The basis for the board's conclusions, as well as alternatives considered by the board and reasons for their rejection, are discussed in appendix B to this statement. Background information is presented in appendix A.

STANDARDS OF FINANCIAL ACCOUNTING AND REPORTING

Activities Constituting Research and Development

7. Paragraphs 8–10 set forth guidelines as to the activities that shall be classified as research and development.

8. For purposes of this Statement, research and development is defined as follows:

(a) *Research* is planned search on critical investigation aimed at discovery of new knowledge with the hope

that such knowledge will be useful in developing a new product or service (thereinafter "product") or a new process or technique (hereinafter "process") or in bringing about a significant improvement for an existing product or process.

(b) *Development* is the translation of research findings or other knowledge into a plan or design for a new product or process or for a significant improvement for an existing product or process whether intended for sale or use. It includes the conceptual formulation, design, and testing of product alternatives, construction of prototypes, and operation of pilot plants. It does not include routine or periodic alterations to existing products, production lines, manufacturing processes, and other on-going operations even though those alterations may represent improvements and does not include market research or market testing activities.

9. The following are examples of activities that typically would be included in research and development in accordance with paragraph 8 (unless conducted for others under a contractual arrangement—see paragraph 2):

(a) Laboratory research aimed at discovery of new knowledge.

(b) Searching for applications of new research findings or other knowledge.

(c) Conceptual formulation and design of possible product or process alternatives.

(d) Testing in search for or evaluation of product or process alternatives.

(e) Modification of the formulation or designs of a product or process.

(f) Design, construction, and testing of pre-production prototypes and models.

(g) Design of tools, jigs, molds, and dies involving new technology.

(h) Design, construction, and operation of a pilot plant that is not of a scale economically feasible to the enterprise for commercial production.

(i) Engineering activity required to advance the design of a product to the point that it meets specific functional and economic requirements and is ready for manufacture.

10. The following are examples of activities that typically would be excluded from research and development in accordance with paragraph 8:

(a) Engineering follow-through in an early phase of commercial production.

(b) Quality control during commercial production including routine testing of products.

(c) Trouble-shooting in connection with breakdowns during commercial production.

(d) Routine, on-going efforts to refine, enrich, or otherwise improve upon the qualities of an existing product.

(e) Adaptation of an existing capability to a particular requirement or customer's needs as part of a continuing commercial activity.

(f) Seasonal or other periodic design changes to existing products.

(g) Routine design of tools, jigs, molds, and dies.

(h) Activity including design and construction engineering related to the construction, relocation, rearrangement, or design of facilities or equipment other than (1) pilot plants (see paragraph 9(h)) and (2) facilities or equipment whose sole use is for a particular research and development project (see paragraph 11(a)).

(i) Legal work in connection with patent applications or

Elements of Costs to be Identified with Research and Development Activities

11. Elements of costs shall be identified with research and development activities as follows:

(a) *Materials, equipment, and facilities.* The costs of materials (whether from the enterprise's normal inventory or acquired specially for research and development activities) and equipment or facilities that are acquired or constructed for research and development activities and that have alternative future uses (in research and development projects or otherwise) shall be capitalized as tangible assets when acquired or constructed. The cost of such materials consumed in research and development activities and the depreciation of such equipment or facilities used in those activities are research and development costs. However, the costs of materials, equipment, or facilities that are acquired or constructed for a particular research and development project and that have no alternative future uses (in other research and development projects or otherwise) and therefore no separate economic values are research and development costs at the time the costs are incurred.

(b) *Personnel.* Salaries, wages, and other related costs of personnel engaged in research and development activities shall be included in research and development costs.

(c) *Intangibles purchased from others.* The costs of intangibles that are purchased from others for use in research and development activities and that have alternative future uses (in research and development projects or otherwise) shall be capitalized and amortized as intangible assets in accordance with *APB Opinion No. 17*. The amortization of these intangible assets used in research and development activities is a research and development cost. However, the costs of intangibles that are purchased from others for a particular research and development project and that have no alternative future uses (in other research and development projects or otherwise) and therefore no separate economic values are research and development costs at the time the costs are incurred.

(d) *Contract services.* The costs of services performed by others in connection with the research and development activities of an enterprise, including research, and development conducted by others in behalf of the enterprise, shall be included in research and development costs.

(e) *Indirect costs.* Research and development costs shall include a reasonable allocation of indirect costs. However, general and administrative costs that are not clearly related to research and development activities shall not be included as research and development costs.

Accounting for Research and Development Costs

12. All research and development costs encompassed by this Statement shall be charged to expense when incurred.

Disclosure

13. Disclosure shall be made in the financial statements of the total research and development costs charged to expense in cash period for which an income statement is presented.

14. Government-regulated enterprise that defers research and development costs for financial accounting purposes in accordance with the Addendum to *APB Opinion No. 2* "Accounting for the Investment Credit" shall disclose the following additional information about its research and development costs:

(a) Accounting policy including basis for amortization.

(b) Total research and development costs incurred in each period for which an income statement is presented and the amount of those costs that has been capitalized or deferred in each period.

Effective Date and Transition

15. This Statement shall be effective for fiscal years beginning on or after January 1, 1975, although earlier application is encouraged. The requirement of paragraph 12 that research and development costs be charged to expense when incurred shall be applied retroactively by prior period adjustment (described in paragraphs 18 and 26 of *APB Opinion No. 9,* "Reporting the Results of Operations:") When financial statements for periods before the effective date or financial summaries or other data derived therefrom are presented, they shall be restated to reflect the prior period adjustment. The prior period adjustment shall recognize any related income tax effect. The nature of a restatement and its effect on income before extraordinary items, net income, and related per share amounts for each period presented shall be disclosed in the period of change.

16. The disclosures specified in paragraphs 13 14 are encouraged but not required for fiscal periods prior to the effective date of this Statement. If disclosures for those earlier periods are made, amounts shall be based to the extent practicable on the guidelines in paragraphs of this Statement for identifying research and development activities and costs.

EXECUTIVE OFFICE OF THE PRESIDENT

OFFICE OF MANAGEMENT AND BUDGET

WASHINGTON, D.C. 20503

April 5, 1976 CIRCULAR NO. A–109

TO THE HEAD OF EXECUTIVE DEPARTMENTS AND ESTABLISHMENTS

SUBJECT: Major System Acquisitions

1. **Purpose.**—This circular establishes policies, to be followed by executive branch agencies in the acquisition of major systems.

2. **Background.**—The acquisition of major systems by the Federal Government constitutes one of the most crucial and expensive activities performed to meet national needs. Its impact is critical on technology, on the nation's economic and fiscal policies, and on the accomplishment of government agency missions in such fields as defense, space, energy, and transportation. For a number of years, there has been deep concern over the effectiveness of the management of major system acquisitions. The report of the Commission on Government Procurement recommended basic changes to improve the process of acquiring major systems. This circular is based on executive branch consideration of the Commission's recommendation.

3. **Responsibility.**—Each agency head has the responsibility to ensure that the provisions of this circular are followed. This circular provides administrative direction to heads of agencies and does not establish and shall not be construed to create any substantive or procedural basis for any person to challenge any agency action or inaction on the basis that such action was not in accordance with this circular.

4. **Coverage.**—This circular covers and applies to:

a. Management of the acquisition of major systems, including:

• Analysis of agency missions • Determination of mission needs • Setting of program objectives • Determination of system requirements • System program planning • Budgeting • Funding • Research • Engineering • Development • Testing and evaluation • Contracting • Production • Program and management control • Introduction of the system into use or otherwise successful achievement of program objectives.

WASHINGTON, D.C. 20503

b. All programs for the acquisition of major systems even though:

(1) The system is one-of-a-kind.

(2) The agency's involvement in the system is limited to the development of demonstration hardware for optional use by the private sector rather than for the agency's own use.

5. **Definitions.**—As used in this circular:

a. *Executive agency* (hereinafter referred to as agency) means an executive department, and an independent establishment within the meaning of sections 101 and 104(1), respectively, of Title 5, U.S. Code.

b. *Agency component* means a major organizational subdivision of an agency. For example: The Army, Navy, Air Force, and Defense Supply Agency are agency components of the Department of Defense. The Federal Aviation Administration, Urban Mass Transportation Administration, and the Federal Highway Administration are agency components of the Department of Transportation.

c. *Agency missions* means those responsibilities for meeting national needs assigned to a specific agency.

d. *Mission need* means a required capability within an agency's overall purpose, including cost and schedule considerations.

e. *Program objectives* means the capability, cost, and schedule goals being sought by the system acquisition program in response to a mission need.

f. *Program* means an organized set of activities directed toward a common purpose, objective, or goal undertaken or proposed by an agency in order to carry out responsibilities assigned to it.

g. *System design concept* means an idea expressed in terms of general performance, capabilities, and characteristics of hardware and software oriented either to operate or to be operated as an integrated whole in meeting a mission need.

h. *Major system* means that combination of elements that will function together to produce the capabilities required to fulfill a mission need. The elements may include, for example, hardware, equipment, software, construction, or other improvements or real property. Major system acquisition programs are those programs that (1) are directed at and critical to fulfilling an agency mission, (2) entail the allocation of relatively large resources, and (3) warrant special management attention. Additional criteria and relative dollar thresholds for the determination of agency programs to be considered major systems under the purview of this circular, may be established at the discretion of the agency head.

i. *System acquisition process* means the sequence of acquisition activities starting from the agency's reconciliation of its mission needs, with its capabilities, priorities and resources, and extending through the introduction of a system into operational use or the otherwise successful achievement of program objectives.

j. *Life cycle cost* means the sum total of the direct, indirect, recurring, nonrecurring, and other related costs incurred, or estimated to be incurred, in the design, development, production, operation, maintenance and support of a major system over its anticipated useful life span.

6. **General Policy.**—The policies of this circular are designed to assure the effectiveness and efficiency of the process of acquiring major systems. They are based on the general policy that Federal agencies, when acquiring major systems, will:

a. Express needs and program objectives in mission terms and not equipment terms to encourage innovation and competition in creating, exploring, and developing alternative system design concepts.

b. Place emphasis on the initial activities of the system acquisition process to allow competitive exploration of alternative system design concepts in response to mission needs.

c. Communicate with Congress early in the system acquisition process by relating major system acquisition programs to agency mission needs. This communication should follow the requirements of Office of Management and Budget (OMB) Circular No. A–10 concerning information related to budget estimates and related materials.

d. Establish clear lines of authority, responsibility, and accountability for management of major system acquisition programs. Utilize appropriate managerial levels in decision points in the evolution of each acquisition program.

e. Designate a focal point responsible for integrating and unifying the system acquisition management process and monitoring policy implementation.

f. Rely on private industry in accordance with the policy established by OMB Circular No. A–76.

7. **Major System Acquisition Management Objectives.**—Each agency acquiring major systems should:

a. Ensure that each major system: Fulfills a mission need. Operates effectively in its intended environment. Demonstrates a level of performance and reliability that justifies the allocation of the nation's limited resources for its acquisition and ownership.

b. Depend on, whenever economically beneficial, competition between similar or differing systems design concepts throughout the entire acquisition process.

c. Ensure appropriate trade-off among investment costs, ownership costs, schedules, and performance characteristics.

d. Provide strong checks and balances by ensuring adequate system test and evaluation. Conduct such tests and evaluation independent, where practicable, of developer and user.

e. Accomplish system acquisition planning, built on analysis of agency missions, which implies appropriate resource allocation resulting from clear articulation of agency mission needs.

f. Tailor an acquisition strategy for each program, as soon as the agency decides to solicit alternative system design concepts, that could lead to the acquisition of a new major system and refine the strategy as the program proceeds through the acquisition process. Encompass test and evaluation criteria and business management considerations in the strategy. The strategy

could typically include: • Use of the contracting process as an important tool in the Acquisition program • Scheduling of essential elements of the acquisition process • Demonstration, test, and evaluation criteria • Content of solicitation for proposals • Decisions on whom to solicit • Methods for obtaining and sustaining competition • Guidelines for the evaluation and acceptance or rejection of proposals • Goals for design-to-cost • Methods for projecting life cycle cost • Use of data rights • Use of warranties • Methods for analyzing and evaluating contractor and government risks • Need for developing contractor and government risks • Need for developing contractor incentives • Selection of the type of contract best suited for each stage in the acquisition process • Administration of contracts.

g. Maintain a capability to: • Predict, review, assess, negotiate, and monitor costs for system development, engineering, design, demonstration, test, production, operation, and support (i.e., life cycle costs) • Assess acquisition cost, schedule and performance experience against predictions, and provide such assessments for consideration by the agency head at key decision points • Make new assessments where significant costs, schedule or performance variances occur • Estimate life cycle costs during system design concept evaluation and selection, full-scale development, facility conversion, and production, to ensure appropriate trade-offs among investment costs, ownership costs, schedules, and performance • Use independent cost estimates, where feasible, for comparison purposes.

8. **Management Structure.**—a. The head of each agency that acquires major systems will designate an acquisition executive to integrate and unify the management process for the agency's major system acquisitions and to monitor implementation of the policies and practices set forth in this circular.

b. Each agency that acquires—or is responsible for activities leading to the acquisition of—major systems will establish clear lines of authority, responsibility, and accountability for management of its major system acquisition programs.

c. Each agency should preclude management layering and placing nonessential reporting procedures and paperwork requirements on program managers and contractors.

d. A program manager will be designated for each of the agency's major system acquisition programs. This designation should be made when a decision is made to fulfill a mission need by pursuing alternative system design concepts. It is essential that the program manager have an understanding of user needs and constraints, familiarity with development principles, and requisite management skills and experience. Ideally, management skills and experience would include: • Operations • Engineering • Construction • Testing • Contracting • Prototyping and fabrication of complex systems • Production • Business • Budgeting • Finance. With satisfactory performance, the tenure of the program manager should be long enough to provide continuity and personal accountability.

e. Upon designation, the program manager should be given budget guidance and a written charter of his authority, responsibility, and accountability for accomplishing approved program objectives.

f. Agency technical management and government laboratories should be considered for participation in agency mission analysis, evaluation of alternative system design concepts, and support of all development, test, and evaluation efforts.

g. Agencies are encouraged to work with each other to foster technology transfer, prevent unwarranted duplication of technological efforts, reduce system costs, promote standardization, and help create and maintain a competitive environment for an acquisition.

9. **Key Decisions.**—Technical and program decisions normally will be made at the level of the agency component or operating activity. However, the following four key decision points should be retained and made by the agency head:

a. Identification and definition of a specific mission need to be fulfilled, the relative priority assigned within the agency, and the general magnitude of resources that may be invested.

b. Selection of competitive system design concepts to be advanced to a test/demonstration phase or authorization to proceed with the development of a noncompetitive (single concept) system.

c. Commitment of a system to full-scale development and limited production.

d. Commitment of a system to full production.

10. **Determination of Mission Needs.**—a. Determination of mission need should be based on an analysis of an agency's mission reconciled with overall capabilities, priorities and resources. When analysis of an agency's mission shows that a need for a new major system exists, such a need should not be defined in equipment terms, but should be defined in terms of the mission, purpose, capability, agency components involved, schedule and cost objectives, and operating constraints. A mission need may result from a deficiency in existing agency capabilities or the decision to establish new capabilities in response to a technologically feasible opportunity. Mission needs are independent of any particular system or technological solution.

b. Where an agency has more than one component involved, the agency will assign the roles and responsibilities of each component at the time of the first key decision. The agency may permit two or more agency components to sponsor competitive system design concepts in order to foster innovation and competition.

c. Agencies should, as required to satisfy mission responsibilities, contribute to the technology base, effectively utilizing both the private sector and government laboratories and in-house technical centers, by conducting, supporting, or sponsoring: • Research • System design concept studies • Proof of concept work • Exploratory subsystem development • Tests and evaluations. Applied technology efforts oriented to system developments should be performed in response to approved mission needs.

agency that acquires major systems will designate an

11. Alternative Systems.—a. Alternative system design concepts will be explored within the context of the agency's mission need and program objectives—with emphasis on generating innovation and conceptual competition from industry. Benefits to be derived should be optimized by competitive exploration of alternative system design concepts, and trade-offs of capability, schedule, and cost. Care should be exercised during the initial steps of the acquisition process not to conform mission needs or program objectives to any known systems or products that might foreclose consideration of alternatives.

b. Alternative system design concepts will be solicited from a broad base of qualified firms. In order to achieve the most preferred system solution, emphasis will be placed on innovation and competition. To this end, participation of smaller and newer businesses should be encouraged. Concepts will be primarily solicited from private industry; and when beneficial to the Government, foreign technology, and equipment may be considered.

c. Federal laboratories, federally funded research and development centers, educational institutions, and other not-for-profit organizations may also be considered as sources for competitive system design concepts. Ideas, concepts, or technology, developed by government laboratories or at government expense, may be made available to private industry through the procurement process or through other established procedures. Industry proposals may be made on the basis of these ideas, concepts, and technology or on the basis of feasible alternatives which the proposer considers superior.

e. Requests for alternative system design concept proposals will explain the mission need, schedule, cost, capability objectives, and operating constraints. Each offeror will be free to propose his own technical approach, main design features, subsystems, and alternatives to schedule, cost, and capability goals. In the conceptual and less than full-scale development stages, contractors should not be restricted by detailed government specifications and standards.

f. Selections from competing system design concept proposals will be based on a review by a team of experts, preferably from inside and outside the responsible component development organization. Such a review will consider: (1) Proposed system functional and performance capabilities to meet mission needs and program objectives, including resources required and benefits to be derived by trade-offs, where feasible, among technical performance, acquisition costs, ownership costs, time to develop and procure; and (2) The relevant accomplishment record of competitors.

g. During the uncertain period of identifying and exploring alternative system design concepts, contracts covering relatively short time periods at planned dollar levels will be used. Timely technical reviews of alternative system design concepts will be made to effect the orderly elimination of those least attractive.

h. Contractors should be provided with operational test conditions, mission performance criteria, and life cycle cost factors that will be used by the agency in the evaluation and selection of the system(s) for full-scale development and production.

i. The participating contractors should be provided with relevant operational and support experience through the program manager, as necessary, in developing performance and other requirements for each alternative system design concept as tests and trade-offs are made.

j. Development of subsystems that are intended to be included in a major system acquisition program will be restricted to less than fully designed hardware (full-scale development) until the subsystem is identified as a part of a system candidate for full-scale development. Exceptions may be authorized by the agency head if the subsystems are long leadtime items that fulfill a recognized generic need or if they have a high potential for common use among several existing or future systems.

12. Demonstrations.—a. Advancement to a competitive test/demonstration phase may be approved when the agency's mission need and program objectives are reaffirmed and when alternative system design concepts are selected.

b. Major system acquisition programs will be structured and resources planned to demonstrate and evaluate competing alternative system design concepts that have been selected. Exceptions may be authorized by the agency head if demonstration is not feasible.

c. Development of a single system design concept that has not been competitively selected should be considered only if justified by factors such as urgency of need, or by the physical and financial impracticality of demonstrating alternatives. Proceeding with the development of a noncompetitive (single concept) system may be authorized by the agency head. Strong agency program management and technical direction should be used for systems that have been neither competitively selected nor demonstrated.

13. Full-scale Development and Production.—a. Full-scale development, including limited production, may be approved when the agency's mission need and program objectives are reaffirmed and competitive demonstration results verify that the chosen system design concept(s) is sound.

b. Full production may be approved when the agency's mission need and program objectives are reaffirmed and when system performance has been satisfactorily tested, independent of the agency development and user organizations, and evaluated in an environment that assures demonstration in expected operational conditions. Exceptions to independent testing may be authorized by the agency head under such circumstances as physical or financial impracticability or extreme urgency.

c. Selection of a system(s) and contractor(s) for full-scale development and production is to be made on the basis of (1) system performance measured against current mission need and program objectives, (2) an evaluation of estimated acquisition and ownership costs, and (3) such factors as contractor(s) demonstrated management, financial, and technical capabilities to meet program objectives.

d. The program manager will monitor system tests and contractor progress in fulfilling system performance, cost, and schedule commitments. Significant actual or forecast variances will be brought to the attention of the appropriate management authority for corrective action.

14. Budgeting and Financing.—Beginning with FY 1979 all agencies will, as part of the budget process, present budgets in terms of agency missions in consonance with section 201(i) of the Budget and Accounting Act, 1921, as added by section 601 of the Congressional Budget Act of 1974, and in accordance with OMB Circular A-11. In so doing, the agencies are desired to separately identify research and development funding for: (1) The general technology base in support of the agency's overall missions, (2) The specific development efforts in support of alternative system design concepts to accomplish each mission need, and (3) Full-scale developments. Each agency should ensure that research and development is not undesirably duplicated across its missions.

15. Information to Congress.—a. Procedures for this purpose will be developed in conjunction with the Office of Management and Budget and the various committees of Congress having oversight responsibility for agency activities. Beginning with FY 1979 budget each agency will inform Congress in the normal budget process about agency missions, capabilities, deficiencies, and needs and objectives related to acquisition programs, in consonance with section 601(i) of the Congressional Budget Act of 1974.

b. Disclosure of the basis for an agency decision to proceed with a single system design concept without competitive selection and demonstration will be made to the congressional authorization and appropriation committees.

16. Implementation.—All agencies will work closely with the Office of Management and Budget in resolving all implementation problems.

17. Submissions to Office of Management and Budget.—Agencies will submit the following to OMB:

a. Policy directives, regulations, and guidelines as they are issued.

b. Within 6 months after the date of this circular, a time-phased action plan for meeting the requirements of this circular.

c. Periodically, the agency approved exceptions permitted under the provisions of this circular.

This information will be used by the OMB, in identifying major system acquisition trends and in monitoring implementations of this policy.

18. Inquiries.—All questions or inquiries should be submitted to the OMB, Administrator for Federal Procurement Policy. Telephone number, area code, 202–395–4677.

HUGH E. WITT
ADMINISTRATOR FOR
FEDERAL PROCUREMENT POLICY

Approved:

JAMES T. LYNN
DIRECTOR

comment

OF THE PUBLIC INTEREST SUBCOMMITTEE ON FEDERAL PROCUREMENT POLICY

industrial innovation

Comment of the Public Interest Subcommittee on the Industry Report on Federal Procurement Policy

The Industry Subcommittee has made a number of recommendations for tilting Federal procurement in a direction favoring innovation. The Public Interest Subcommittee wholeheartedly supports some of these recommendations. There are others with which we have some disagreement. But before detailing the specific agreements and disagreements, there is a general theme which appears in this report upon which we must comment.

CRITICAL EVALUATION

The industry report notes that "one of the major hurdles which any innovation must surmount is peer evaluation." Worry is expressed about the effect of critical evaluation. The report says, "By recognizing and calling attention to all of the potential hazards and risks of a new idea, one can be sure of a high intellectual batting average, but the idea may be killed." Going on to say that "Powerful organizations of critics with effective legal, publicity, and political arms have become active in the United States in recent years with the objective of blocking the introduction of technological advances." A little later in the paper it says "Still another roadblock to innovative contributions by industry is the threat of overregulation and legal harassment." Nuclear power is used as an example. They point out that it only took 18 months from Fermi's demonstration of a chain reaction to the construction of three nuclear reactors in 1945 and the production of the first plutonium—about the same amount of time it takes today for an environmental impact statement.

Since the members of our Subcommittee represent some of those "powerful" organizations conducting "legal harassment," we feel compelled to respond to that kind of statement. And a most appropriate response may be that "fools rush in where wise men fear to tread." Unfortunately, the fools who rush in often are not the same people who may suffer for the folly.

We haven't checked the record of the Hanford, Wash. reactors. But what of the Utah residents and the soldiers in the areas of the atmospheric nuclear tests of the 1950's? If today's laws and regulations had been in effect then, would those people be dead and dying of leukemia and other cancers today? And what of asbestos? Would the introduction and widespread use of asbestos both in government shipyards and ships and in the private sector be possible under today's laws? Probably not. A little delay and a little testing would have saved the lives of the 2 million workers it is estimated will die of cancers related to their workplace exposure to asbestos.

One might be able to excuse the country's behavior in 1945 on the grounds of ignorance and perhaps on the grounds of a war emergency. But today we have bitter experience and masses of evidence to warn us of the probable consequences of our actions, and we must act accordingly.

COMMON USE ITEMS

Returning to the subject of procurement, we wholeheartedly endorse the recommendations of the industry committee on the procurement of common use items. When the Government must buy items which are consumer type items, the GSA should use its testing facilities to determine the performance and safety of the off-the-shelf commercial product. If the results of the testing are good, then it is important for the Government to realize the savings possible by buying a common commercial product.

Where performance or safety of a commercial product is somewhat lacking, then a technology-forcing role is a critical one for GSA. Such a role implies the use of performance standards, and the encouragement of competition of companies of all sizes, to draw forth a wide variety of innovative responses. We agree with the industry report, which points out that this is not only important in the procurement of major systems for which OMB Circular A–109 directs this approach, but also for common use items. As one member of our Subcommittee put it, "A lot of what we have around our houses is junk." Judging from the reports which appear in the press, the Government is no better off.

Such an approach not only holds the promise of increasing innovation through the pull of government purchasing power, but it also can provide significant benefits for consumers. This can occur in several ways: Through the sharing of test results, through the development of better techniques for judging the cost of a product, and through the stimulation of innovation responsive to particular needs—needs which the Government and consumers have in common.

As government tests products in its own laboratories, particularly commercially available products, it should disseminate the results of that testing to the public. Care should be taken, of course, to disseminate the information about competing products together, to

avoid favoring one of what may be several equally good products.

We strongly support a high priority on the further development, perfection, and application of techniques of looking at product costs over their entire life cycle. Such information is needed not only to conserve government funds, but is also the type of information which consumers need for their own decisionmaking.

The unmet or inadequately met needs of government procurement are often very similar to those of the public at large. People on military bases, for example, have the same needs as consumers in general. We would ask the GSA to recognize some of these common needs and to stimulate innovation through requests for designs. Competitions or demonstration projects would be appropriate in these areas.

The Government could play a critical role through technology-forcing procurement. Imagine the incentive to manufacture air bags for passenger automobiles if the Government now required passive restraints in the 16,000 vehicles it buys annually and the 6,000 it leases, as well as in its fleet of 80,000 vehicles.

The technology for passive restraints has existed for a long time now. In the late 1960's, development was in full swing at General Motors, and there were plans for installation in the 1973 and 1974 models. In 1970, development was purposely slowed. The Department of Transportation has now set a deadline of 1984 for passive restraints, but who knows whether that deadline will be met or delayed. If the auto companies had to have air bags to sell to the government, they might also make them available to the public. The technical invention called the air bag, which should have been available years ago, would be on its way to becoming a fully developed innovation.

INDEPENDENT RESEARCH AND DEVELOPMENT

Several of the recommendations of the Industry Subcommittee on procurement concern independent research and development by Federal contractors, particularly defense contractors. The Industry Subcommittee recommends that independent research and development be treated as an ordinary cost of doing business, so that it can be passed through to the Government. They ask for the removal of the requirement for Potential Military Relationship for independent research and development in DOD contracts. They say, "Let the competitive marketplace judge the technical quality and relevance of competitive independent research and development programs, except for large noncompetitive production programs." And they ask that dollar ceilings be removed, and that technical evaluation of industrial independent research and development programs by government agencies be deemphasized.

In denouncing the limitation which has been placed on the passthrough of independent research and development—which applies only to negotiated or cost reimbursable contracts—the Industry Subcommittee points out the importance of research which is not oricntcd to any particular mission. This is what other people might call basic research. When government or defense contractors cannot pass through as much of those expenses as they need to, as the "competitive market" dictates, they argue, then we have the dire consequences of failure to innovate, such as "technical surprise." To bolster their argument, they make reference to the business sector, pointing out that a small portion of the price of every new car, TV set, or bar of soap goes for independent research and development.

The Public Interest Subcommittee has grave problems with this approach. For us, the problems lies with the nature of this type of government contracting, which is antithetical to the terms "competitive" or "marketplace." Defense contracting creates client firms, firms which know no other marketplace and have no other expertise. In that situation one could argue endlessly about what is an adequate amount of I. R. & D. to allow response to indefinite future government needs, or how much of previous R. & D. should be quantified into the current project.

As we view it, the Government should try to exit from that trap altogether. It should strongly try to discourage firms from being totally dependent on defense contracts. All firms should be required to develop civilian capabilities and civilian markets which are related to their defense contracting activities. Consumers can then benefit from the government dollars spent on defense, and firms can spread their overhead.

Side benefits might also be realized from such a policy. There might be increased cost-consciousness and cost-savings techniques transferred to defense bidding. And the dependent constituency which often is opposed to changes in defense missions which must be made for political or other reasons would be reduced.

DEFENSE R. & D. AND CONVERSION

At the present time, spending on research and development for national defense and the space program makes up what our Subcommittee feels is a disproportionate amount of total Federal spending on research and development. In 1976, $13.5 billion of public funds was devoted to defense and space R. & D.—about 60 percent of total government spending on R. & D. In an era of scarce government funds, such allocations directly detract from alternative uses. They directly detract from the support available for developing the foundations of innovations in social priority areas. And the high level of support for defense R. & D. may discourage creative resources—technical skills and capital—from being employed on innovations which could improve industrial productivity.

We would put forth two alternative recommendations. We recommend that defense spending should be subjected to an effort at zero-based budgeting. The effort should include a determination of whether an excessive proportion of government spending on research and development is devoted to defense. And it should include an assessment of the effect of defense R. & D. on personnel available for civilian R. & D. and on the costs of civilian R. & D.

We also recommend that all defense contracts require firms to make efforts to find civilian applications for

their knowledge and skills, and to plan for conversion to civilian research or production when defense contracts are terminated.

PATENTS

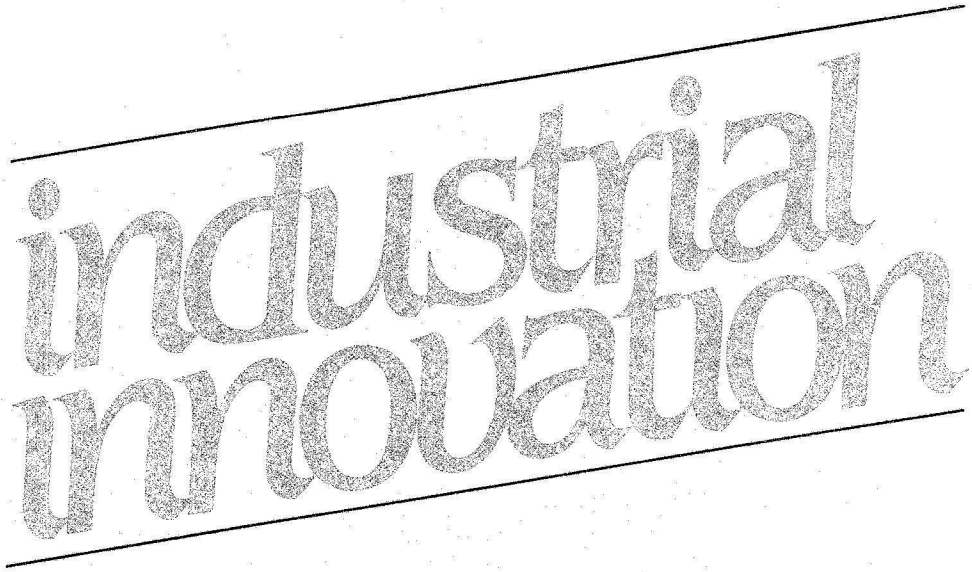
There is one more area in which the Public Interest Subcommittee must take exception with the recommendation of the Industry Subcommittee on procurement. That area is the treatment of patents where the invention has been developed with government funding. The Industry Subcommittee asks that the contractor be given the right to retain title to all patents developed under government funding, reserving to the Government only the right to use the patent and the right to require the contractor to license the patent. We do not feel that this recommendation is in the interest of the public.

That which is developed with government funds belongs to the people. While there is undoubtedly room for improvement over the way licensing of patents held by the Government is now conducted, that is not sufficient reason to give those patents away to private concerns. Instead, government should undertake to review the patents it now holds, and make greater effort to disseminate information about their nature and potential, with a view to encouraging licensing from the Government. And we would add that any such licensing agreements should look to providing just compensation, based on the commercial value of the invention, to the inventor, along the lines recommended in the Public Interest paper be provided to investors employed in private companies.

SUMMARY

To summarize, the Public Interest Subcommittee is vitally concerned with the direction of innovation in society. We support recommendations for government testing of common use items, for purchase of commercial items when they are found to be effective and safe, for the dissemination of the results of testing to consumers, for the use of performance standards and the fostering of competition for innovative response to government needs, and for the use of the pull of government purchasing power to better fulfill needs which government and consumers often share in common, because all of these recommendations have the potential of encouraging and channeling innovation in ways which will fulfill the need of consumers and citizens as well as meet government missions. On the other hand, we cannot support recommendations on I. R. & D. which will lead to increased government spending on R. & D. for defense purposes and to increased dependence of defense contractors on the Federal Government. And finally, we cannot support the recommendation which would give away, to private development, the patents which have been developed with public funds. Such patents should be used for the public benefit rather than for private profit.

INDUSTRIAL SPECIAL REPORT ON SMALL BUSINESS



The Effects of Domestic Policies of the Federal Government upon Innovation by Small Businesses

A report of small-busines members
who served on the Industrial Innovation Advisory Committee
that was established as part of the Domestic Policy Review.

May 1, 1979

Notice: This report represents the views of the several members from small business who served on the Advisory Committee on Industrial Innovation, an advisory committee that was convened by and reported to the Secretary of Commerce. This report of the committee members from small businesses does not necessarily represent the views of the Department of Commerce, the Small Business Administration, or any other agency of the Federal Government.

INTRODUCTION

In mid-1978 President Carter ordered a review of the impact of Federal policies upon industrial innovation. The President directed Secretary of Commerce Juanita Kreps to supervise this study, and she appointed an Industrial Advisory Committee to work under the direction of Dr. Jordan Baruch, Assistant Secretary for Science and Technology to advise her on this project. This Industrial Advisory Committee was composed of approximately 150 business executives who were divided into seven subcommittees to analyse specific areas of Federal policy and their impact upon private decision making relative to innovation.

While most members of the several subcommittees were from large corporations, each group included one executive from small business who participated in the work of the Committee and made contributions to the draft reports that were produced. Because the small-business representation was limited in comparison to the much larger representation of large corporations, one would expect that the Subcommittee draft reports would not analyse the small business situation in appreciable depth. There is however, almost universal recognition by the seven subcommittees that small businesses make a large contribution to innovation, and that the policies, laws, regulations, and procedures of the Federal Government impose a very heavy burden upon small business innovation.

Upon completion of the draft reports of the seven subcommittees, the small-business representatives decided that an additional report should be prepared on the specific impact of Federal policies upon innovation in small businesses, and how Federal policies might be revised to again stimulate innovation in this important sector of the economy. We wish to emphasize that our report is not a minority report expressing disagreement with the subcommittees, but a supplement to address the importance, and the unique role and problems of small innovative enterprises in America. We wish to place emphasis upon certain areas of the draft reports and make additional recommendations of our own.

Without detracting from the strong vigor of our recommendations, it must be noted that there are diverse opinions amongst our Committee members with respect to emphasis, priority, and details of our recommendations.

THE AD-HOC COMMITTEE OF SMALL-BUSINESS MEMBERS *

George S. Lockwood, Acting Chairman
President, Monterey Abalone Farms
Monterey, Calif.
(Member—Subcommittee on Environmental, Health, and Safety Regulations)

Wayne H. Coloney
Chairman and Chief Executive Officer,
Wayne H. Coloney Company
Tallahassee, Fla.
(Member—Subcommittee on Procurement and Direct Support of Research and Development)

* The membership listed after each name indicates the Subcommittee of the Industrial Innovation Advisory Committee upon which the individual served.

Eugene M. Lang
President, REFAC Technological Development Corportion
New York, N.Y.
(Member—Subcommittee on Economic and Trade Policy)

Duane Pearsall
President, Small Business Development Corporation
Littleton, Colo.
(Member—Subcommittee on Industry Structure and Competition)

Eric P. Schellin, Esq.
Attorney at Law
Arlington, Va.
(Member—Subcommittee on Patents and Information)

Dr. Robert C. Springborn
President, Springborn Laboratories
Enfield, Conn.
(Member—Subcommittee on Procurement and Direct Support of Research and Development)

SUMMARY OF CONCLUSIONS

- Innovation is an essential ingredient for creating jobs, controlling inflation, and for economic and social growth.
- Small businesses make a disproportionately large contribution to innovation. There is something fundamental about this unusual ability of small firms to innovate that must be preserved for the sake of healthy economic and social growth.
- If the U.S. desires to bring inflation under control, to create new and better jobs, and to continue to enjoy the economic and social benefits of innovation, individual entrepreneurs and their small companies must be free to innovate. Unfortunately, the environment for small business innovation has greatly deteriorated during the past decade.
- The creative process in small businesses are pronouncedly different from large corporations and institutions. There is a lack of awareness within government of how small independent innovators create and how Federal polices determine the climate for small business innovation.
- A wide array of Federal policies adversely impact upon small innovative businesses, including:
  - —Federal tax, pension fund, and security policies that have virtually eliminated all forms of capital from small innovative business ventures;
  - —Government regulations that treat large and small firms equally that are, in fact, discriminatory against small firms;
  - —Federal funding for research and development where the most innovative sector of the American economy, small science and technology based enterprises, are virtually excluded from effective participation;
  - —Federal procurement policies that similarly exclude small innovative firms;
  - —Patent policies that have resulted in the diminution of the value of patent protection for independent inventors and small businesses.
- With sufficient amendments to Domestic Policies to provide relief for small creative enterprises, a major renaissance in anti-inflationary innovation will emerge with concomitant social and economic growth. Such amendments will require a major departure from current policies affecting small businesses in capital acquisition, regulation, R. & D. funding, procurement, and patents.

SUMMARY OF RECOMMENDATIONS

1. Changes in the Federal tax code to again encourage the flow of capital into small innovative businesses.
2. Changes in ERISA policies to return a portion of our national flow of savings to high-risk innovation.
3. Changes in security laws and regulations to remove obstacles for innovative enterprises to acquire seed, startup and expansion capital.
4. Changes in regulatory policies to remove adverse discrimination against the small innovator.
5. Changes in federal R. & D. funding policies to produce substantially greater results by awarding a larger share to small businesses.
6. Changes in Federal procurement policies to allow greater participation by small businesses on a more equitable basis.
7. Strengthening our weakened patent system, and making changes in Federal policies to recognize and protect initial exclusivity as an essential requirement for successful innovation.

* Specific details for these recommendations are included at the end of this report.

healthy economic and social growth.

7. Changes in ERISA policies to return a portion

The Effects of Domestic Policies of the Federal Government upon Innovation by Small Businesses

Innovation is an essential ingredient for economic and social growth. It is the driving force that increases productivity and that results in new products, processes, and services. Innovations create new and better jobs, reduces production costs and prices, increases foreign sales, and increases real personal income so that our citizens can finance major advancements in the qualities of life such as better education, improved health care, increased longevity, and more leisure and recreation.

Without innovation, economic stagnation occurs resulting in rising prices, decreased employment, and increased foreign competition—all symptoms of stagnation including inflation. Inflation, our nation's major problem is, in our opinion, a direct result of a large decline in private sector innovation over the past decade.

To a large extent, the mandates of the U.S. electorate to fulfill basic social and human needs of our citizens requires a rapid rate of economic growth. Such social and economic growth can only occur with vigorous private sector innovation.

SMALL BUSINESSES MAKE A DISPROPORTIONATELY LARGE CONTRIBUTION TO INNOVATION

The economic history of the United States is replete with examples of small innovators making major contributions. From the late 1700's through the 1970's a major source of technological advancement was the result of individual inventors and entrepreneurs working independently of our large industrial corporations, universities, and government laboratories. This is particularly true in situations where radically new concepts have been introduced.

In our early history we had Eli Whitney in 1793 with his cotton gin and Robert Fulton with the steamboat in the 1840's. These two innovations had an enormous impact on young America. Later came the railroads. Next, in telecommunications, we had Morse and Bell, whose contributions greatly accelerated the growth of our economy. Similarly, Edison, Westinghouse, McCormack, the Wright Brothers, Ford, and DeForest made introductions that laid the foundation for further economic advancements. This is only a partial list. All of these innovators were small guys.

The same trend continued after World War II with the success stories of Land at Polarioid and Watson at International Business Machines. During the 1960's we saw the emergence of companies such as Xerox, Digital Equipment, and Hewlett-Packard, each beginning as individuals with their small companies who were free and able to innovate. In addition to these better known names, there were thousands of small high-technology companies spawned during the 1950's that have created major growth in our economy and have increased the quantity alnd quality of employment.

A recent study by the National Science Foundation concluded that in the post World War II period, firms with less than 1,000 employees were responsible for half of the "most significant new industrial products and processes." Firms with 100 or fewer employees produced 24 percent of such innovations. In addition, the cost per innovation in a small firm was found to be less than in a large firm since small firms produced 24 times more major innovations per research and development dollar expended as did large firms. Yet small firms conduct only 3 percent of U.S. research and development. While there is much innovation that can only occur in large resourceful companies, small firms are often more adverturesome and have a greater propensity for risk taking, and accordingly are able to move faster and use resources more efficiently than large companies. *We believe that there is something fundamental about the unusual ability of small firms to innovate that must be preserved for the sake of healthy economic and social growth in the United States.*

SMALL INNOVATIVE BUSINESSES CREATE JOBS AND TAX REVENUES AT A RAPID RATE

The role of small innovative businesses in stimulating economic growth can be seen from two recent studies. The first, by the Massachusetts Institute of Technology Development Foundation, shows compounded average annual growth from 1969 to 1974 for the following three groups of companies:

	Sales (percentage)	*Jobs* (percentage)
Mature companies	11.4	0.6
Innovative companies . . .	13.2	4.3
Young high-technology companies	42.5	40.7

In this study, *mature companies* were Bethlehem Steel, DuPont, General Electric, General Foods, International, Paper and Procter and Gamble. *Innovative companies* were Polaroid, Minnesota Mining and Manufacturing, International Business Machines, Xerox, and Texas Instruments. *Young high-technology companies* included

Data General, National Semiconductor, Compugraphics, Digital Equipment, and Marion Laboratories. The companies selected in each group were, in every case, leaders in their particular industry.

The M.I.T. report states:

> It is worth noting that during the 5-year period, the six mature companies with combined sales of $36 billion in 1974 experienced a net gain of only 25,000 jobs, whereas the five young, high-technology companies with combined sales of only $857 million had a net increase in employment of almost 35,000 jobs. The five innovative companies with combined sales of $21 billion during the same period created 106,000 jobs.

This study also observed that the *innovative companies* produced three times the level of tax revenues as a percentage of sales as did the mature firms.

Conclusions similar to those mentioned above emerged from a study of 269 firms by the American Electronic Association. In February 1978, Dr. Edwin V. Zschau of the A.E.A. presented the results of that study to the Senate Select Committee on Small Business. The report showed the following growth of employment for new established firms as contrasted to more mature companies:

Years since founding	*Stage of Development*	*Employment Growth Rates in 1976* (percentage)
20+	Mature	0.5
10–20	Teenage	17.4
5–10	Developing	27.4
15	Startup	57.7

Dr. Zschau also reported that annual benefits to the economy realized in 1976 for each $100 of equity capital that had been invested in *startup* companies founded between 1971 and 1975 were:

• Foreign sales	$70 per year
• Personal income taxes	$15 per year
• Federal corporate taxes	$15 per year
• State and local taxes	$ 5 per year
• Total taxes	$35 per year

This data shows that the benefits of investment in small innovative ventures are large (e.g., jobs are created and these jobs are kept at home—exports are created instead of imports—a new $35 per year flow in tax revenues is realized for each $100 initial investment). This large and powerful flow of benefits starts soon after the investment is made, and the benefits are substantially greater than those of large corporations.

The huge benefits derived from a favorable climate for small business innovation is apparent from this review of the contributions to economic growth made by individual entrepreneurs and their small companies. *If the United States desires to bring inflation under control and to continue to enjoy the economic and social benefits of innovation, individual entrepreneurs and their small companies must be free to engage in innovation.*

THE ENVIRONMENT FOR SMALL BUSINESS INNOVATION IS NOT HEALTHY

It is clear to us that innovation is the keystone of economic and social growth, and that individual entrepreneurs and their small innovative businesses have contributed a disproportionately large share of innovation. It is also clear that the climate for the formation and nurturing of small innovative enterprises in America has suffered a major deterioration over the past 10 years and as a result innovation has withered.

There are no concise indices for innovation, although productivity is one measurable result. From the close of World War II until the mid-1960's, the average annual productivity increase for each manufacturing worker was approximately 4.1 percent. From the late 1960's through the mid 1970's, it averaged 1.6 percent per year. In 1978 it was 1.0 percent, and some economists are predicting a rate of 0.4 percent for 1979. This is a tenfold decline that has occurred steadily over the past 15 years.

Similar trends of a substantial downward nature can be observed in the flow of capital to small firms. In the 7 years from 1969 through 1975, the amount of capital acquired by small firms with less than $5 million in net worth from public markets declined from approximately $1,500 million to approximately $15 million—a hundredfold decrease. No significant improvement has occurred in the past 3 years. However, during this period of catastrophic decline, capital raised by all corporations in the public security markets increased from $28 billion in 1972 to over $41 billion in 1975, or an increase of approximately 50 percent. This hundredfold decline in capital flow to small innovative enterprises is indicative of the decline in small business innovation because risk-capital is an essential ingredient of innovation.

Without precise indices for small business innovation, it is impossible for us to quantify this key factor accurately. It is our observation as experienced entrepreneurs in our respective industries however, that the vigor in small business innovation has substantially declined. We would estimate that this decline amounts to a level of 10 percent (or less) of the average innovation from 1950 to 1970—or at least a tenfold decline. We regret that we cannot be more precise in estimating this important factor, but we believe that this estimate, based upon our personal observations, is realistic.

In our opinion, a renaissance in innovation in America is possible, but a basic systemic change must first occur in governmental policies affecting small innovative businesses. The needs of innovators, their incentives to innovate, and obstacles to their creativity are often substantially different for small firms than for large mature corporations. In most cases government policymakers and administrators fail to recognize this critical difference between large and small businesses. As a result, major constraints to innovation unintentionally imposed by government must be modified if a rebirth of vigorous innovation is to occur in the United States.

THE DISTINCTIVE CHARACTERISTICS OF THE CREATIVE PROCESS IN SMALL BUSINESS

Creative processes in small businesses have some pronounced differences from the creative processes in large corporations. In both cases, however, the processes usually have the following steps in common:

- *Conception*—the use of scientific, market or other knowledge to conceive a new product, process, or service to fill a need.
- *Reduction to practice*—taking this concept from an idea into a practical reality, such as a first-model prototype.
- *Startup*—adapting the first-model prototype for production and sales.
- *Expansion*—with successful early production, expansion of production and sales.

With success, a concept moves laboriously through these stages until the firm and its markets mature. Significant employment and tax revenues are generated during the later stages of this process.

Until maturity is achieved and expansion levels out, this creative process is usually a struggle for the innovator and his small firm—

- a struggle to obtain adequate capital (usually in several increments);
- a struggle to make the breakthroughs necessary to overcome the never ending unexpected obstacles;
- a struggle to make the first precious sale (or to get the first proposal accepted), to meet an optimistic delivery schedule, and to keep the first customers happy;
- a struggle to keep development costs and initial production costs within available capital;
- a struggle to collect accounts-receivable and other payments in time to meet the next payroll (a particular struggle when selling to the government);
- a struggle to convince the banker that sales, production cost, and cash flow projections are realistic and that customers will pay on schedule;
- a struggle to acquire and motivate a team of capable scientific, engineering, production, and management talent.

There is usually a delicate balance between success and failure in this struggle.

The capital required for this creative process is usually acquired from individual outside sources and not from a flow of earnings as is the case of large corporations; a critical difference between large and small firms.

Entrepreneurs often spend 15 hours per day, 7 days a week, to meet this challenge. Time and personal energy are the most precious assets in this process. The intensity of this struggle, requiring the strong personal commitment of the innovator, is usually much greater in a small business than in a large corporation. The willingness of the small business innovator to undertake this intense struggle is one significant reason why small businesses make disproportionately large contributions to innovation. *The intensity of this struggle and the vigorous commitment with which it is executed by the entrepreneur is a unique component of small business innovation.*

WHAT INCENTIVES MOTIVATE THE SMALL INNOVATOR TO MEET THIS STRUGGLE

New concepts are only generated from individuals, and creative individuals need an environment that is conducive for creation with rewards, recognition, profits, freedoms, and the availability of capital, basic knowledge, and other tools with which to create. *There appears to us to be a lack of understanding within government of how individuals create in the private sector, and how they implement their creations—particularly small independent innovators.*

The stimulation of setting out on one's own, trying his own ideas, working in an environment with few disapproval levels, that permits and encourages new approaches and even radical ideas, and has a "put your entire personal assets on the line" element of risk, coupled with a chance for a reward of above average wealth for his intense labors, are important motivations for the innovator in small businesses that are different from large corporations.

During the historically innovative 1950's and 1960's, and even into the early 1970's, there was a steady stream of individuals who were motivated to leave large corporations, universities and government to form small scientific and technical businesses. This stream is now a dribble. There was, at that time, a favorable climate where the creative individual had freedom to innovate and had access to capital.

Since then many governmental disapproval levels and obstacles have emerged, risks have gone up, rewards have come down—and at the same time the availability of capital for small American enterprises has declined to an all time low. The entrepreneural climate is now dismal and a substantial portion of the community of the technically creative are dispirited. There are mountains to be climbed that are going unclimbed. There is useful scientific knowledge that has been developed in our universities and elsewhere that is not being used to fill social and economic needs. There are products to be developed and manufactured that are still only ideas in inventors' heads. There are innovative businesses that should be started that are not being started. This *inability for creative individuals to undertake is of great concern to this Committee.*

FEDERAL POLICIES DETERMINE THE ENTREPRENEURAL CLIMATE

There is a wide array of Federal policies that adversely impact upon small business entrepreneurs that have resulted in the arrest of this heretofore highly innovative sector of our society. The Federal policies

that determine the entrepreneural climate are in the following areas:

- *Capital Availability.* Unlike large corporations that fund R. & D. and other innovative investments from cash flows from mature products, a small business innovator must acquire capital from outside sources. *Federal tax, pension fund, and security policies have virtually eliminated all forms of seed, startup, and expansion capital from small innovative business ventures.*

- *Regulation.* Two essential requirements for the creative individual are time and freedom to create. Both time and freedom are being consumed with the ever increasing scope of government regulatory activities that have emerged since 1970. Interferences and delays by government compound the entrepreneur's struggle, sap his creative energy, and increase the risk of failure. Many small firms are unable to understand and comply with government regulatory processes and to effectively participate in law and rule making that have a life or death impact upon their firms. *The present system of applying regulations equally to large and small businesses heavily discriminates against small businesses.*

- *Federal Funding for R. & D.* In recent years, federal support for R. & D. has declined as a percentage of GNP and has become highly concentrated in a few large companies, universities, and federal laboratories. While direct support for applied research and development at these institutions has grown, *the most innovative sector of the American economy, small science and technology based enterprises, are virtually excluded from effective participation in federally funded applied research.*

- *Federal Procurement.* The largest buyer of goods and services in the world is the U.S. Government. The process of selling in this market and meeting government specifications chews the small innovative business to bits. There is little room for innovation within Federal supply specifications and procurement procedures. The effect of these procedures is to prevent small business participation and deny the Government of potential sources of innovation that would lower procurement costs, and provide new and improved products and services. *In the interest of innovation and of good procurement, small innovative firms should be provided greater participation in this important market.*

- *Patents.* The historic keystone to inventiveness and information transfer has been our U.S. patent system. Patent grants have provided the small innovator protection against competition by large resourceful firms, and this protection has often provided incentives for capital acquisition. Unfortunately in recent years the value of patents has weakened considerably due to inadequate Patent and Trademark Office procedures resulting in adverse judicial decisions. In addition, substantial uncertainty has emerged as a result of a wide range of interpretations within the Federal judiciary of patent law. At the present time, over 50 percent of patents contested at the circuit court level are invalidated, and the cost of defending such suits is prohibitive for a small firm. *A return to a strong patent system is essential for a rebirth in innovation.*

THESE SAME FEDERAL POLICIES FORCE CONCENTRATION OF INNOVATION INTO FEWER AND FEWER LARGE FIRMS

Simultaneous with the decline in the formation of new innovative enterprises there has been a concurrent acquisition of existing small innovative companies by large corporations. The unfortunate trends in the above policy areas is forcing concentration:

- Those Federal policies affecting *capital* acquisition, coupled with the U.S. corporate income tax rate structure, force rapidly expanding small businesses to seek big firms with capital resource in order to obtain expansion capital;

- *Estate tax* considerations force many small innovative firms to sell their companies to large public firms. The highly restrictive *security exchange* policies accent this problem.

- In some industries the *regulatory burden* is beyond the ability of small firms to handle, while in others it is a major deterrent to creativity;

- In *Federal procurement*, small firms (even those with outstanding products) cannot compete with large companies that specialize in this market;

- The weakened *patent system* forces the small patent holder into litigation with expenses so great that the small business cannot protect its rights against larger infringers, including government.

In order to acquire capital to meet expansion needs; to avoid high estate taxes; to obtain Federal regulatory permits; to sell a new product to the Government; or to defend its patents, it is frequently necessary for the small innovative firm to sell out to a larger firm with greater resources. When this occurs, the research and development budgets are often soon cut and the innovative entrepreneurs leave the firm. A creative independent organization is changed into a static dependent one.

SOME GENERAL CONCLUSIONS

1. Technological innovation is essential to control inflation. And, it is essential if we are to fill our pressing social and human needs.

2. Independent entrepreneurs and their small businesses have made a disproportionately large contribution to anti-inflationary innovation. Unfortunately, small business creativity is blocked by a wide array of Federal policies.

search and develop

3. *A renaissance in innovation is possible.* The removal of unintended government inhibitors would allow small businesses to innovate again.

4. A fundamental reason for the decline in innovation is the failure of Federal policymakers and administrators to recognize the contributions from small firms to technological innovation, and their failure to recognize that small innovative firms cannot accommodate the burdens of government as readily as large companies. The burden of government upon small innovators is disproportionately large and often overwhelming. *Government policies and regulations that treat large and small firms equally are, in fact, discriminatory against small firms.*

5. When government recognizes the destructive nature of this disproportionate and overwhelming burden upon the small innovator, and when sufficient amendments to domestic policies are accomplished to allow relief, a major renaissance in anti-inflationary innovation will emerge in America with concomitant social and economic growth. For this to occur, *a major departure is necessary from current federal policies affecting small businesses* in capital acquisition, regulation, R. & D. funding, procurement, and patents.

Specific recommendations follow for each of these policy areas.

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CAPITAL AVAILABILITY AND RETENTION

An essential ingredient for innovation is capital, and the lack of seed, startup and expansion capital is probably the major factor throttling innovation by small businesses. Unfortunately, significant changes have occurred in tax laws, security exchange regulations, and federally mandated pension fund management policies during the past decade that have drastically reduced the flow of capital into new innovative businesses.

THE CAPITAL ALLOCATION PROCESS FOR SMALL BUSINESS INNOVATION IS SIGNIFICANTLY DIFFERENT THAN FOR BIG CORPORATIONS

Innovation in large corporations is largely financed from the flow of earnings from mature products, and in many cases, sophisticated rate-of-return analyses are used to allocate this cash flow into promising areas of research, product development, and facility expansion. In addition, the profitable corporation receives an immediate income tax benefit of approximately 50 percent for research and innovation related expenses, and a 10 percent tax credit for related capital expenditures.

In contrast, the small independent innovator without a cash flow from one or more mature products must usually acquire his capital from external sources, often in several increments. No tax credits are available to the independent innovator until his new product becomes profitable. The net effect is that the small guy must raise from outside sources more than twice the amount of capital for the same innovation as a large corporation.

The disparity between the small business and the large corporation is further increased since debt capital is unavailable to the small firm to finance innovation, at least not until first profitability for the new product occurs. While debt is an important source of capital for large corporations, it is less available to small firms.

Furthermore, during the capital intensive stage of early and rapid expansion where initial profitability occurs, the high corporate income tax rate structure prevents the small firm from accumulating sufficient retained earnings to finance the internal expansion of its new product. In order to expand and protect its new market successes, the small enterprise must often turn to outside sources for capital. In contrast, the large corporation with mature business lines is usually able to supply all stages of capital from earnings of existing products.

In acquiring capital for each stage of innovation—seed, startup, and expansion—the Federal tax code adversely and substantially discriminates against the small creative business.

FEDERAL SECURITY POLICIES ALSO DISCRIMINATE AGAINST INNOVATION

The rules of the Security Exchange Commission that are established to prevent investment fraud, act to exclude from capital markets small innovative enterprises that do not have a proven flow of earnings from mature products. The registration and reporting requirements of the SEC are prohibitively costly to the small enterprise. In essence, the SEC is doing its job of preventing fraud by preventing all types of small businesses—both good and bad—from access to public markets.

Large corporations can afford access to public capital markets but small innovative firms are virtually excluded.

FEDERAL TAX LAWS DISCOURAGE INDIVIDUAL INVESTORS FROM MAKING INNOVATIVE INVESTMENTS

Individual investors in the towns and cities across America in the past have played an important role in providing seed, startup, and expansion capital for innovation. In many (if not most) cases of significant innovation individual investors have been the only source of seed capital for the independent innovator to move from concepts into practical realities.

Unfortunately, changes in tax policies over the past 10 years now favor areas for investment for individual investors other than innovation. Retirement funding, real estate, oil and gas drilling, and agriculture receive favorable tax treatment while innovation does not. We do not believe that real estate speculation and cattle feed lots are as important to healthy economic growth as is technological innovation—yet real estate and cattle feeding are favored and innovation is not. Innovation cannot compete for capital with these activities that are favored in the tax code.

Of additional concern to us are Federal policies that encourage retirement funding. In 1970, legislation was passed to encourage retirement savings by providing tax-sheltered Individual Retirement Account (IRA) and

apply the major factor inhibiting innovation by small

Keogh plans so that the savings of doctors, lawyers, businessmen, and others with high income would be channeled into professionally managed institutional investment pools. In 1973, pension fund management policy legislation (ERISA) was passed requiring that such pools be managed by a "prudent man rule" that essentially precludes the use of this savings flow for small innovative businesses. Where prior to 1970 a substantial supply of savings throughout America was available for local enterprising inventors and entrepreneurs, this flow of savings is now diverted into tax-sheltered centralized institutional investment pools that are precluded by law from investing in local promising ventures.

This combination of IRA-Keogh-ERISA acts like a huge vacuum sweeper moving around the country extracting innovative capital and placing it into large centralized funds where it is invested in the securities of governments, in large corporations, and into real estate. Hundreds of billions of dollars have been removed from local discretionary investments and locked up. *In our opinion, this tax code induced removal of local discretionary investment decisionmaking has caused a major disaster for innovation.* This shift in investment decisionmaking has been particularly disastrous for high-risk seed capital needs where ideas are first reduced to realities by using funds provided by friends, relatives, and personal acquaintances of the inventor on the local scene.

SPECIAL CONSIDERATIONS FOR SMALL INNOVATIVE BUSINESSES ARE NECESSARY

It is our opinion that large amounts of risk-capital will again flow into small innovative businesses if Federal tax laws are changed to put small business innovation at a parity with large corporations—and at a parity with other investment alternatives for independent individual investors. Without such parity discrimination is occurring where small businesses cannot compete for capital for innovation.

Special considerations are necessary for our highly innovative sector of the economy and an amended tax code, changes in SEC policies, and revised ERISA rules are essential for the stimulation of a badly needed renaissance in anti-inflation innovation. It is the opinion of the members of this Committee that the following recommendations should be undertaken:

RECOMMENDATION NO. 1—CHANGES IN THE FEDERAL TAX CODE

- A new class of equity security be created for start-up innovative businesses that would couple the benefits of limited partnerships with the benefits of Subchapter "S" Corporations. This new equity class would possess the following features:

  —limited liability protection,
  —include up to 100 investors,
  —allow corporated investors,
  —allow the use of cash basis accounting for tax determinations,
  —allow operating losses and investment tax credits to flow through to individual funding investors in the year occurred,
  —allow specialized equipment and instrumentation for research, development, or testing to be expensed in the year purchased.

  This new class of stock and its benefits should be available to small businesses that spend in excess of 5 percent of their gross sales revenues in research and development as determined by Generally Accepted Accounting Principles (GAAP).

- Allow investors in small science and technology based firms to defer paying capital gains taxes on equity investments, provided the gains are reinvested in other small science and technology based firms within 2 years;

- Reduce the Federal tax on gains from capital investments in small science and technology firms to a level of 50 percent of the otherwise applicable capital gains rate, if the investment is held for a minimum of 5 years;

- Allow small science and technology firms to carry forward losses for a period of 10 years instead of 5 years;

- Restore the Qualified Stock Option Plan for key employees in small science and technology firms, and establish the period for exercising stock options at 10 years;

- Provide for a 25 percent tax credit for research and development related expenditures by small businesses (as currently allowed in Canada);

- Revise the corporate income tax rate to provide greater retention of earnings during the initial startup and growth phases for small science and technology firms;

- Allow small business concerns to establish and retain a "reserve for research and development" in profitable years to be used in periods of business stress, with the maximum level of this reserve being 10 percent of gross revenues;

- Treat license royalities as capital gains instead of ordinary income;

- Eliminate the existing tax liabilities for overseas joint ventures in which the small business investment consists of a contribution of know how and technical information;

- Permit small businesses to take double deductions of expenses directly related to export market development.

RECOMMENDATION NO. 2—CHANGES IN INVESTMENT MANAGEMENT

- Modify ERISA to allow up to 5 percent of pension fund portfolios to be invested in small businesses;

- Encourage state investment pools to invest a larger percentage of their holdings in small innovative businesses.

RECOMMENDATION NO. 3—CHANGES IN SECURITY EXCHANGE LAWS AND REGULATIONS

- Exempt from SEC registration offerings of equity securities for innovative businesses outlined in Recommendation No. 1 of less than $2 million;

- Change the charter of the Security Exchange Commission to specify the *encouragement* of the flow of capital into small innovative enterprises as well as to protect the public investor.

The objective of these first three recommendations is to remove unintended obstacles that have arisen and to provide incentives for the allocation of seed, startup, and expansion capital to promising innovative ventures, by:

- Providing tax parity for small innovative firms equal to that of large corporations;

- Providing tax parity for investments in innovation equal to that provided for alternative investment opportunities for independent investors;

- Allowing greater retention of retained earnings for early expansion;

- Removing SEC discrimination;

- Releasing locked-up capital in retirement funds.

We believe that the loss in tax revenues from these recommendatons will be miniscule when compared to increased tax revenues to be received within several years of enacting these changes. The tax umbrella that would be provided for stimulating small business innovation would not be applicable to the large earning flows for large mature corporations nor would they be available for noninnovative individual investments. While we appreciate that our recommendations might result in some compromises in investor protection against fraud and losses, and that there may be some problems of definition and of administrative convenience, we believe that these costs will be minor compared to the overall societal benefits resulting from the rebirth in anti-inflation innovation that would follow.

REGULATION

During the past decade, a new regulatory environment has emerged to fulfill a wide variety of social "mandates." This environment includes new agencies such as OSHA, EPA, CPSC, NTSB, and EEOC, in addition to expanded jurisdictions of existing agencies such as FDA, SEC, FTC, DOE, DOT, Justice, Corps of Engineers, and others involved in the regulation of business in one way or another. We believe that the mission of each of these agencies is well intended and, if only one (or a few) of them were impacting upon small innovative businesses, their impact could be absorbed within the creative process. Unfortunately, for many small businesses there is mandatory involvement with a wide range of agencies and, in some cases, the laws and regulations being enforced were intended for large sources of hazards, or for some other purpose than to control the new field being pioneered by the innovator.

In some new fields, the regulatory environment is so intense and so diverse that the whole of this impact is greater than the sum of the parts. *The small guy is overwhelmed by the law making, rule making, and enforcement processes of regulation.* This intense diverse regulatory environment is contributing to inflation in two ways—by impeding innovation (particularly innovation in small enterprises)—and by adding significantly to business costs.

REGULATION IS A MAJOR DETERRENT ON THE CREATIVE PROCESS

The overwhelming nature of widespread regulation results in an adverse interference with the innovative process, pushing the balance away from success. The innovator's most precious assets of time and energy are drained. Expensive delays are experienced, and the creative entrepreneur and his scientists and engineers are kept on the defensive—not on the offensive that is necessary for their success.

In addition to regulations contributing to inflation, a serious consequence of this new regulatory environment is that economic progress is distorted in favor of those fields where government involvement is minimal and where innovation can occur relatively untrammeled. In those fields where regulation is diverse and intense, greatly reduced entrepreneural activities are experience, and only those innovators who can map and navigate the governmental process can succeed.

The costs of regulation to the innovative process in small business are large and real.

GOVERNMENT FAILS TO RECOGNIZE THE DISPROPORTIONATELY HEAVY IMPACT OF THE REGULATORY PROCESS UPON SMALL BUSINESS INNOVATION

When approaching government, the small businessman often encounters a presumption of harm and dishonesty, or at best, indifference, and not a sympathetic understanding of the peculiar needs and problems of the small guy attempting to be creative. The legislative and rule-making processes are impossible forums for his participation and his bureaucratic adversaries have substantially greater influence and credibility in these processes. Laws, rules, policies, and procedures often are made for "administrative convenience," and such administrative conveniences usually become an inconvenience for the innovator. As a society we must address the question of whose convenience is more important—the bureaucrat's or the innovator's?

During the 1970's, "due process of law" in American democracy has become an unfamiliar phenomenon to the small innovator—the process is closed to him—and grossly discriminates against him. This adversary regulatory process in America today has caused the remain-

ing few small innovators to consider government as an alien power committed to their destruction.

The small innovative business cannot deal with this intense and diverse regulatory environment as readily as can the large corporation. If a rebirth of innovation is to occur, government must recognize this adverse discrimination and a major departure from current regulatory processes that affect small innovative businesses is necessary.

In view of this deleterious impact of Federal regulation upon small business enterprises, and the serious consequences of inflation and stymied innovation, we wish to make the following recommendations:

RECOMMENDATION NO. 4—CHANGES IN REGULATORY POLICIES

- A thorough revision of the regulations and operating procedures of OSHA as they relate to small innovative business to include:
  - —A general exemption from OSHA, except where the accident history of a particular industry or firm is substantially greater than average, and in such cases, the burden should be upon OSHA to justify action; and
  - —The prohibition of first instance citations except in extreme cases.

- In all regulatory activities, the burden should be placed upon each regulatory agency to establish a cause of concern before requiring regulatory compliance by a small business. Minimum levels of impact should be statutorily defined thereby exempting small businesses in all but extreme and justifiable cases.

- Substantial strengthening of the Regulatory Council to include:
  - —participation by the Small Business Administration;
  - —requiring all regulatory agencies to balance the risks of a hazard against the economic costs, with thorough consideration of specific impacts on proposed regulations upon small business creative processes;
  - —the use of "performance standards" and not "method standards" in those cases where regulatory standards are clearly justified;
  - —wherever possible, return to reliance upon standards associations with federally mandated standards being the last resort;
  - —improved congressional oversight of the regulatory process as it relates to small innovative businesses.

- Provide product liability and recall insurance at reasonable costs for small businesses, with exemptions from recalls except in the most extreme cases; and the establishment of statutory limits of liability for product failures similar to Workman's Compensation Insurance.

The OSHA problem is particularly serious for small innovative enterprises that have to deal with this agency, and a revision in OSHA policies and practices is necessary. Some members of our Committee believe that it would be in the best interest of workplace safety as well as of industrial innovation to eliminate OSHA entirely. Others agree, but believe that this may be politically impractical. Still others are of the opinion that government can improve workplace safety with the significant amendments to present policies and procedures that we are proposing.

The recently published report *Making Prevention Pay* by the Inner-Agency Taskforce on Workplace Safety and Health concludes that OSHA has failed to make an improvement in workplace safety during the past decade. And, it is clear to us that the burden of this program on small innovative businesses is discriminatory and highly adverse. In addition, OSHA is an agency that has generated an enormous amount of litigation, and in cases of appealed OSHA citations, over 50 percent have been vacated. Yet, litigation is not a form of relief for small innovative businesses—the OSHA rule-making and appeals process, and judiciary relief, is a costly and time consuming game that small enterprises cannot play. Therefore, the burdens of citations should not be placed upon small businesses, at least in the first instance, and we urge that the burden be placed upon government to demonstrate on a case by case basis that unusually great hazards exist before OSHA can exercise jurisdiction in the case of small businesses.

In most other areas of regulation, it is our opinion that the burden of compliance for small business enterprises should be substantially reduced, and in many cases can be eliminated without materially compromising the overall objectives of the subject regulation. It is virtually impossible for the struggling innovator to comply with the never ending forms, mandated reports, applications, investigations, inspections, permits, licenses, standards, variances, checklists, guidelines, plans, study-sessions, public meetings, rulemakings, nonrulemakings, hearings, nonhearings, burdens of proof, appeals, etc., and to accommodate the rapidly growing enforcement budgets at all levels of government to "make business comply." The language of government is a strange tongue written by lawyers for judges that is as incomprehensible to the small innovator as is the regulatory process itself. This government problem is more than simply a paperwork blitz—it is a major consumer of time, energy, and capital, and is sometimes absolutely prohibitive.

We believe that it is essential that a clearly specified level of impact or hazard exposure be established before a business is regulated, to allow the entrepreneur to innovate without the burden of regulation consuming his precious time, drive, and capital, and in causing inordinate delays for him to learn the appropriate rules, accomplish their compliance, and obtain appropriate permits. The burden is particularly onerous upon the innovating entrepreneur attempting to do something new since most existing laws are intended to eliminate some other form of evil.

The new regulatory environment is another example of how government policies unfairly discriminate against small innovative firms by treating them the same as big corporations. Some big corporations can survive in this regulatory game—they can enter lawmaking and rule-making procedures, retain experts to ply the most subtle interpretations of the rules, and can afford the time and costs of appeals and litigations, etc., —the small guys simply cannot because "the due proc-

ess" is too time consuming, costly, and technically overbearing. If the small guy tries, the balance in his struggle for survival weighs heavily towards failure. *Therefore, we strongly believe that reasonable exemptions are necessary for small firms if our sector of the economy is to be revitalized as a major source of non-inflationary innovation.*

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DIRECT FUNDING OF R. & D. BY THE FEDERAL GOVERNMENT

Economists consistently state that technological innovation is the principal contributor to U.S. economic power and is necessary in order to continue to advance our standard of living. And research and development is one of the critical ingredients of innovation. Economists also state that the social return on R. & D. is high with some estimating it to be twice the private return. For these reasons, together with the anti-inflationary impact of innovation, we believe that it is important to increase our national investment in R. & D.

FEDERAL SUPPORT FOR R. & D. HAS DECLINED AND HAS BECOME CONCENTRATED

While we believe it is important to increase our national investment in R. & D., this investment, as a percentage of gross national product (GNP), has been declining since 1968, while that of some countries (Japan in particular) has continued to rise. One-half of our R. & D. investment is privately financed and one-half is from Federal sources; with one-half the Federal R. & D. being for defense. While industrial R. & D. expenditures have held their own as a percentage of GNP during the last 20 years, government R. & D. has not kept up with the growth in GNP. In the Federal area, small business receives only 3½ percent of Federal R. & D. expenditures.

Of additional concern to us is that four agencies —Defense, Space, Energy, and HEW—fund 88 percent of Federal R. & D. Similarly, there is a concentration of U.S. industrial R. & D. into a few industries and into a few companies. According to *Science Indicators, 1976,* six industries account for 85 percent of total U.S. industrial R. & D. Ten companies do 36 percent, and 31 do over 60 percent. Greater than 80 percent of industry's R. & D. is carried out by *only* 200 firms.

We believe that this concentraton of private R. & D. into a few large firms is not in our national interest. While there is such a great concentration of private R. & D, it is small business that has accounted for one-half of our total major innovations, over the past 20 years and it did so while conducting only 3 percent of the total U.S. R. & D. This is a powerful testimony for the contributions and effectiveness of small innovative businesses. *Science Indicators* also reports that during the 20 year period from 1953 to 1973, small businesses contributed 24 times the number of major innovations per dollar of R. & D. as did large firms. In addition, the total cost for maintaining a scientist or engineer in R. & D. for a small business has averaged one-half of that for large firms. It is further reported that inventors in universities contributed far less frequently.

In view of these facts, we must ask why so much of our Federal R. & D. is awarded to large firms, Federal laboratories and universities, and so little to small business since technological innovation is critical to our social-economic progress. *We believe that a larger share of federally funded R. & D. awarded to small businesses would produce substantially greater results.*

REVISED INCENTIVES WILL STIMULATE PRIVATE INNOVATION

One of the critical obstacles to more productive R. & D. funding is the lack of recognition within government that innovation usually does not result from research findings without proper incentives to put these findings to work. The objective pursued by most Federal R. & D. recipients is to meet the precise specfications required by the Government and not to pursue innovative ideas and commercialization of results. This requirement to pursue narrow objectives prevents innovation. In universities the incentive is to uncover new knowledge and to publish these findings in scientific journals—not to produce innovations for commercialization in the private sector.

Sometimes federally funded applied R. & D. in universities and government laboratories is aimed at preventing a private firm from gaining a technological lead, or in duplicating private technological successes with the objective of public disclosure. Such competition with the private sector, particularly with small firms, is a substantial disincentive to the innovator and to his sources of capital.

We believe that greater private sector utilization of scientific knowledge generated by federally funded research is desirable, and commend the Small Business Innovation Program of the National Science Foundation as a successful model. This imaginative program is directed specifically at converting research on Federal objectives into innovation in the private sector. It provides incentives for the small science and technology based firm, venture capital firms, private investors, large companies, and universities to work together to explore and finance advanced concepts leading to new products, processes, and services. This program provides strong incentives for the utilization of science to do new things.

The members of our Committee believe that it is essential that governmental policymakers concerned with innovation make better utilization of incentives for the commercialization of research knowledge. We also believe that government must take steps to assure that the disincentives to private initiative of deliberate preemptive and duplicatory work, and competition with the private sector at universities or government laboratories be prohibited, and that steps be taken to ensure that this prohibition is enforced.

AN ADVANCING SCIENTIFIC ENVIRONMENT IS ESSENTIAL FOR INNOVATION

The final concern of the Committee is the health of science in America. U.S. science clearly leads the world with 50 percent of the total science-based Nobel prizes during the past 30 years. While this science excellence has existed since World War II, the industrial competitiveness of U.S. technology has declined, and much of the benefits of our excellence in science has been transferred overseas. We have received little in return, except that we now import large amounts of foreign goods made possible by our scientific advancements. *We must point out that small business does not establish and train our overseas technological competitors—small innovative businesses create jobs, income, and exports at home.*

We must also comment upon what we believe to be an unhealthy mix of basic and applied research at our universities that is mandated by Federal funding requirements. We support the principle that universities are a proper environment for much of our basic research. However, government support to universities for *applied* research has increased more than six times during the past 20 years, while industry's percentage has declined from approximately 50 percent to 20 percent.

Federal laboratories and nonprofit institutions have also prospered in applied research funding. We must respectfully point out, however, that major innovations have not come out of our universities, federal laboratories, and nonprofit institutions with a frequency comparable to those emanating from small businesses. *We must again ask why we do not have more applied research conducted by small businesses.*

While some individuals may claim that applied research in universities is necessary to train an increasing number of scientists and engineers, a 1979 Department of Labor report states that 47 percent of those who received doctorates between 1970 and 1977 were not able to get jobs in fields that required that level of education, and that this problem is projected to persist through 1985.

In summary, the Committee believes that there is a need to increase federal R. & D. expenditures and that this increase should go in new directions.

RECOMMENDATION NO. 5—CHANGES IN POLICIES FOR FEDERAL FUNDING OF R. & D.

- The decline in R. & D. expenditures as a percentage of gross national product must be arrested and redirected upwards towards the goal of 3 percent by 1985.

- This increase should be heavily directed towards basic research at universities and applied research and development in the private sector, with strong incentives for commercialization.

- There should be decreased emphasis on applied research in universities, federal laboratories, and nonprofit institutions, particularly where such applied work might preempt private initiative or is duplicatory or competitive with private sector activities.

- Each Federal agency should be directed to allocate at least 10 percent of its R. & D. budgets to small business and increase current levels by 1 percent of its budget each year until the 10-percent minimum is established, starting in 1980.

- Each year, starting in 1980, each agency with a budget of over $100 million for R. & D. should allocate at least 1 percent of its R. & D. budget to the small business program using the same format as that of the National Science Foundation but with their own research topics, and review and awards procedures. This program should be coordinated by an Inner-Agency Small Business R. & D. Committee chaired by the Small Business Administration.

- A clear Federal policy should be established and enforced to prohibit Federal funds from being used to finance projects that are competitive with or duplicatory of private sector technological developments, or in any other ways might prevent the establishment by small businesses of exclusive technological or intellectual properties in new areas of nondefense technological advancement.

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FEDERAL PROCUREMENT POLICIES

The U.S. Government is the largest purchaser of goods and services in the world. Federal procurement policies greatly affect the ability and incentives for government contractors to innovate.

Unfortunately, Federal procurement rules and their administration are grossly discriminatory against small businesses. Large corporations are able to follow changing trends well in advance in procurement and to influence specifications to favor their companies. They know the system, can handle it, and can afford large government marketing staffs to effectively compete. Small businesses, which have historically provided 50 percent of the most significant innovations, are essentially precluded from this process. We do not believe this is in the national interest. Small businesses need a greater opportunity to participate.

At present, the Federal procurement system chews the small innovator to bits. The small firm has little negotiating power and cases of unfair discriminatory treatment against small innovative businesses are legion. For example, patent policies in some agencies result in patent rights being awarded to large contractors, yet small firms rarely are able to obtain patent rights under similar circumstances. In addition there are cases where patent rights developed at the expense of a small business have been required to be assigned to the Government for use by others as a condition of the small firm obtaining a government contract.

Small businesses are further discriminated against in government payment procedures. Delays occur in receiving payments and the small business is less able to obtain low-cost loans to carry overdue government receivables. In addition, debt service is not a reimbursable cost.

It is the opinion of this Committee that changes should be initated in procurement policies in order to

able to those emanating from small businesses. ... businesses. Large corporations are able to follow...

encourage and allow greater participation by small innovative businesses on a more equitable basis.

RECOMMENDATION NO. 6—CHANGES IN FEDERAL PROCUREMENT POLICIES

- Cost sharing requirements for research and development awards for small businesses shall be eliminated and negotiated, fees shall be allowed on all R. & D. awards;

- No Federal agency shall exclude small business from a fair and equitable opportunity to compete on a merit basis on the same terms as other participants;

- No agency shall restrict opportunities for small businesses to submit unsolicited proposals and shall give such proposals a fair review based upon their merit. Each agency shall provide small firms opportunities to receive sole source awards;

- Independent research and development costs, and bid and proposal costs, shall be allowable costs for small business firms at a rate for small businesses of at least two times the level allowed for large businesses.

- A separate set of simplified Federal Acquisition Regulations should be developed to apply to small business firms;

- All proposals submitted by small business must be awarded or declined within 4 months of submission;

- Proposal evaluations shall consider total costs relative to the work proposed, and not consider overhead or indirect cost rates due to variations in institutional and company accounting practices;

- Fee negotiations shall take into consideration the level of interest rates and shall be higher in times of high interest rates than in times of low interest rates. All debt service costs shall be allowable costs for small businesses, and procedures should be instituted for prompt payments to small businesses, with late payment penalties;

- Every Federal agency should study policies and procedures that discriminate against small businesses, and to institute changes that will equalize opportunity without harming the public interest.

PATENTS

Our Patent System has Weakened

It is with alarm and consternation that we report two major weaknesses that have emerged in the patent system in recent years that are damaging incentives for innovation, particularly by small science and technology businesses. The usefulness of patents has diminished dramatically.

The first weakness is that judicial decisions, at the trial court level, are resulting in 50 percent of the patents issued by the U.S. Patent and Trademark Office being declared invalid when contested. In the 10 circuit courts of appeal, this figure becomes 72 percent. As a result, the innovator seeking patent protection is inviting expensive litigation to test the validity of his patent, and the odds greatly favor his potential competitor, often a resourceful large corporation wishing to use his technology. A basic reason for such judicial invalidities is that the Patent Office did not have available to it, or was unable to identify, or failed to use, prior art that the courts declare as preemptive.

The second major weakness is that the cost incurred in defensive patent litigation sometimes approximates $250,000, which is usually an impossible burden for a small business. These developments are inhibiting to innovation and place the small innovative business in a position of not being able to benefit from the patent protection to which it is entitled and that may be necessary for its success.

It must be recognized that the reliability of patents is the keystone in the commitment of funds to carry out the commercialization of a patented (or potentially patentable) invention. Few entrepreneurs and investors are willing to risk time, energy, and funds in the commercialization of an invention in a free market economy knowing that the path they are pioneering may soon be trod upon by others, including large firms with greater resources and with preferential access to the market for the new invention. As a result, the only legal method to protect newly pioneered technology is by maintaining new technology as a trade secret. Tying up significant discoveries and inventions in trade secrets is not in the public interest since knowledge transfer does not occur for others to use.

OTHER GOVERNMENT AGENCIES FAIL TO RECOGNIZE THE NECESSITY OF INITIAL EXCLUSIVITY FOR SUCCESSFUL INNOVATION

Although our constitutionally provided Federal patent system is intended to provide exclusive protection to inventors with novel contributions, the importance of this policy of exclusivity is frequently ignored by government. We believe that a change in attitude within government about exclusivity of technology by small business would substantially enhance innovation. Small firms pioneering new techniques are often treated as large resourceful corporations attempting to monopolize markets. In some cases government vigorously attempts to preempt or duplicate technology being pioneered by small firms in order to prevent initial exclusivity. The result is that in such fields where government R. & D. activities are preemptive or competitive, interest by entrepreneurs and risk-capital sources diminishes. This Committee believes that there must be a greater awareness within government that exclusivity is frequently a substantial motivation in decisions to pioneer new fields.

It is unfortunate that the benefits of patent protection of initial exclusivity have greatly diminished for small businesses and this trend favors large resourceful corporations that can afford expensive litigation. *It is the small innovative businesses that make a far greater contribution to innovation in America that are being deprived of the protection necessary for them to become established.* We therefore have the following recommendations for strengthening incentives for innovation provided by the patent system:

- Fee negotiations shall take into consideration the

SUCCESSFUL INNOVATION

RECOMMENDATION NO. 7—CHANGES IN PATENT POLICIES

- The Patent and Trademark Office should develop a practical and effective computer-based search and retrieval system for its own use and public access, with particular concern for its usefulness for small business firms.

- A new mandatory reexamination procedure should be instituted in the Patent and Trademark Office whereby a litigant who raises a defense of invalidity of a patent based on new found heretofore unconsidered art should first test the assertion of invalidity in the Patent Office where the most expert opinions exist at a much reduced cost.

- The budget of the Patent Office should be increased sufficiently to allow for more thorough searching of prior art using the most modern search technology.

- The patent laws should be amended to recognize that the reliability of patents is a keystone in the commitment of funds to carry out commercializations of patented inventions, and incontestability should be mandated after a period of time so as to result in absolute reliability, except in cases of fraud.

- Legislation should be passed to give small businesses title to inventions made under government contracts, with the provision that commercialization be undertaken in a reasonable time. If such commercialization is not undertaken, title should revert to the Government and the Government should license small businesses. As an alternative, small business should be able to obtain title to inventions developed under government awards if they invest an amount of capital at least equal to the amount of the R. & D. award under which the invention occurred. Likewise, with inventions made in national laboratories, the Government should preferentially license small business concerns.

- Small businesses should be able to obtain (with appropriate restrictions) compulsory licenses through suitable proceedings in cases where uncommercialized patents block entry into new markets.

- The Justice Department should be required to undertake competitive impact studies for taking antitrust action against small business when a small business is attempting to exploit the full property rights afforded by its patent.

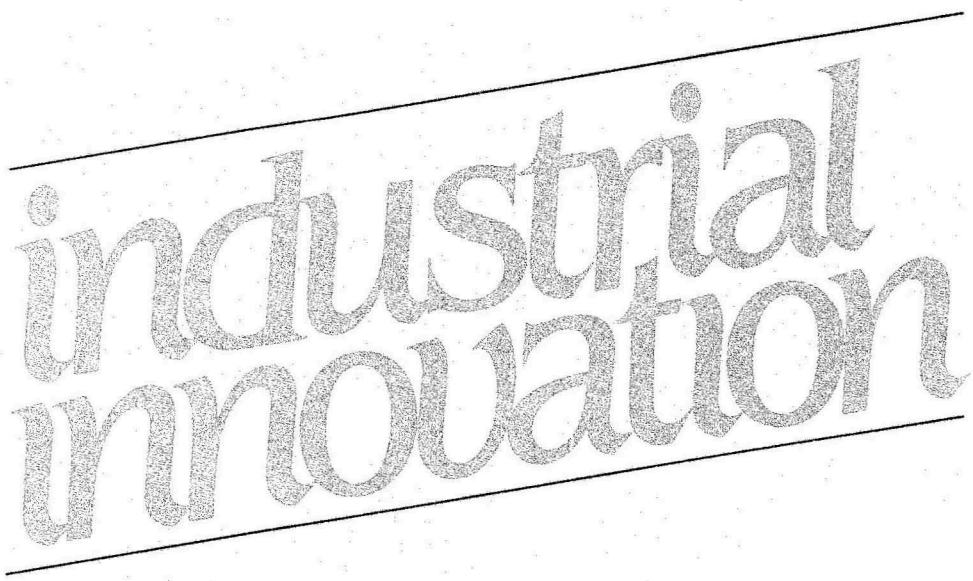
* * * * *

This report is only a brief compilation of the recommendations that we believe are important to lead to a renaissance in anti-inflationary technological innovation by small business enterprises. We hope that we have articulated the distinctive characteristics of the creative process in small businesses that are substantially different than the creative processes in large corporations. In most cases, the same government regulations, policies, and processes applied to all businesses, in effect, discriminate against small innovative businesses.

The necessary exemptions and the special needs of small innovative businesses are usually discarded by Federal policymakers because it is feared that they will be applied to all industry. Yet we believe that special considerations are useful and tolerable if restricted by ceilings to levels meaningful to our sector of the American innovative community. The issue of special treatment for small innovative enterprises in the formulation of laws, policies, and governmental processes is more than a matter of equity—it is a matter of national concern because of the far reaching ramifications of innovation in economic and social growth and the disproportionately large contributions of independent innovators. The potential for continued innovative contributions from small business is far too great to continue to be ignored, and meaningful special considerations must be made.

With the removal of the disincentives that are now imposed upon small innovative businesses, we are confident that the amazing resourcefulness of American innovators will again emerge and result in material social and economic growth for our country.

LABOR SUBCOMMITTEE REPORT



Statement of the Labor Advisory Committee on Industrial Innovation For the Domestic Policy Review of Industrial Innovation, February 1979

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We believe it is essential that the views of organized labor be understood and incorporated in the report, recommendations, and options which the Industrial Innovation Coordinating Committee presents to the President. Among our key points:

1. The best stimulus for innovation comes from a healthy, full employment economy—not from tax breaks and not from weakening protections for workers' health and safety, protections for consumers, and protections for the environment.
2. Workers and their unions have reasonable, legitimate concerns about job-loss and income-loss caused by innovation. Healthy economic growth provides the incentives for innovation and the resources for humane social adjustment to innovation.
3. Collective bargaining can ease many of the problems created by innovation. An early warning system involving labor and business and government can improve labor-management and other social adjustments to innovation and changing technology.

FULL EMPLOYMENT AND PRICE STABILITY

Industrial innovation is essential to healthy economic growth, rising productivity, and higher living standards. But economic growth and full employment are prerequisites to industrial innovation. Without a healthy, expanding, full employment economy, without the expanding mass markets made possible by rising real income and rising consumer buying power in the pockets of workers and their families, there is little incentive for business to engage in capacity expansion and in industrial innovation.

Furthermore, a full employment economy is the key to successful, humane adjustment to the job-displacing effects of industrial innovation and technological change. Microlevel dislocation is much easier to deal with when macroeconomic policies aim at and achieve full employment. Only an expanding full employment economy with increasing job opportunities for all who seek work can deal effectively with the needs of America's working people and their families.

Workers and their unions have reasonable, understandable, and legitimate concerns about loss of jobs and loss of income. If these concerns are met adequately and effectively, workers and unions will be more receptive to change and innovation.

Social and personal adjustments to industrial innovation are much easier in the context of economic growth and full employment, whereas slow economic growth or recession increases the hardship of social dislocation and workers' adjustment problems resulting from new technology and industrial innovation. Furthermore, slow economic growth or recession discourages industrial innovation by raising the risks and lowering the payoff from innovation.

Over the long run, industrial innovation can contribute a great deal to reduction of inflation, to rising productivity, and to the competitiveness of the American economy in world markets—but it would be wrong to give excessive emphasis to the role of innovation in dealing with these problems when the sources of these problems are so heavily involved in two major recessions in 1969–70 and 1973–75 and in lagging economic recovery, in persistent high unemployment, in high interest rates and tight money policies, in the pricing policies of foreign oil-producing nations, in the managed economies and trade policies of other nations, and in the job-exporting, technology-exporting foreign trade and foreign investment policies of U.S.-based multinational corporations.

THE KEY ROLE OF COLLECTIVE BARGAINING

Industrial innovations change the way goods and services are produced and distributed—and industrial innovation, for all its potential benefits, including creation of new jobs, can also have destructive effects on workers and their jobs.

That is why workers and their unions have a vital interest in how innovation is introduced in the workplace—to make sure people don't get squashed by innovation and new technology, to make human values prevail.

Innovation often involves labor-saving operations—increased production with the same number of fewer workers. This may displace existing jobs. Of course, new jobs may also be created. But the impact of innovation may be to eliminate some jobs, change the job content of others, change skill requirements, and change the flow of work.

Innovation often causes changes in industry location—shutdowns of departments and entire plants and shifts to new locations in suburban or outlying areas and sometimes overseas. No industry is immune to such changes, which are constantly shifting the structure of skills, occupations, jobs, and earnings of American workers.

Collective bargaining holds a vitally important role in meeting the challenges and opportunities and dangers of innovation and new technology. There is much to be learned from past experience in this area of collective bargaining. The flexibility of this institution, the American system of labor-management bargaining at the plant, company, and industry level, helps workers and the unions that represent the workers negotiate and settle with employers on reasonable and humane protections for workers against the potentially adverse effects of job-destroying technological innovation. Mature collective bargaining relationships between labor and management provide more opportunities and a sound basis for special labor-management committees to deal with innovation adjustment within the framework of collective bargaining.

Collective bargaining can help democratize labor-management relations and humanize the workplace and work itself, including the impact of innovation and new technology on workers' jobs and earnings. Collective bargaining can provide cushions to soften the adverse impact on workers by setting up adjustment procedures and programs at the workplace. In a full employment

economy—linked with adequate employment services, employment and training programs, and unemployment compensation—the disruption of workers' lives and the job displacement resulting from innovation and technological change can be minimized.

The costs to the employer of the adjustment process, the adjustment cushions, should be viewed by business as part of the cost of industrial innovation. The costs of progress very reasonably and properly should include and compensate for the human costs of technological innovation.

SOME TECHNIQUES OF LABOR-MANAGEMENT COOPERATION

Many labor-management agreements already include a broad range of negotiated specific adjustment procedures.

One method to ease the human costs of industrial innovation is to assure advance information to workers and their unions about management plans for future innovation which will affect workers with job loss or other serious problems. Major innovations result from management decisions taken long before the innovation is actually introduced. The shutdown of the Youngstown, Ohio, steel plant involved corporate decisions taken years earlier. Certainly there should be long advance notice before any innovation or technological change which results in layoffs or plant shutdown. The failure of management to institute worker safety-health and environmental protections should not be the way workers and their unions learn about intended shutdowns.

An "early warning system" of advance notice makes it possible for workers and unions to discuss and to consult and to negotiate with management and to achieve labor-management cooperation to meet the problems of affected workers. Such "early warning" provisions have long been standard in many union contracts. With advance notice and labor-management cooperation, workers can look for or train for a new job, perhaps with the same employer in the same plant or at another location. Employer-paid retraining opportunities are an important part of any adjustment-to-innovation program.

There are other methods and techniques for labor-management cooperation to cushion adverse effects from industrial innovation and changing technology. These include income maintenance with work and/or pay guarantees. One way is through "no-layoff" attrition to reduce the workforce by natural turnover, deaths, retirements, and voluntary quits, thus protecting the jobs and earnings of those workers who remain with the company. Of course, attrition alone is not an adequate solution. "Red circle" earnings protection for workers downgraded through no fault of their own attaches a wage rate to an individual instead of to the job itself and thus protects workers against loss of income which might result from innovation-induced downgrading.

Seniority is a key principle in protecting workers against layoffs and downgradings. This is not simply a matter of rewarding long service. It reflects the worker's investment in the job and the company's investment in the worker. Early retirement is an option that older workers should have available when innovation or major technological change wipes out their jobs. But the option should be available as a "free choice," not as a requirement. Many older workers cannot afford to retire early and others prefer to continue working.

Transfer and relocation rights and mobility assistance to workers are other ways to provide job and income protection. Within-plant and interplant transfers, relocation assistance, severance pay, pension rights and seniority protections, and supplemental unemployment benefits can all help cushion adverse effects on workers and their familities when industrial innovation occurs.

More information is needed on the effects of industrial innovation and new technology on workers. Federal action is needed to set up a clearinghouse to gather information on a continuing basis on innovation and technological change and its effects on the welfare of the American people, on jobs, skills, training needs, and industry location. With more and better information, public and private adjustment programs can better avoid needless human hardship and suffering which too often result from the disruptive impact of changing technology and innovation.

Through this clearinghouse, the Federal Government could provide unions and employers with comprehensive information and service, upon request, to help develop labor-management solutions for the complex problems related to the impact of innovation and technological change at the workplace.

Innovation-caused economic dislocation and other kinds of dislocation—including plant shutdowns caused by technology change, job loss from trade policies, and production shifts away from defense-related industry—require cooperative labor-management efforts and also national programs to deal with these complex problems. Further exploration is needed of a variety of such programs, including such proposals as Congressman Ford's bill, H.R. 76, dealing with plant shutdowns and plant relocation, and Senator McGovern's bill, S. 2279, dealing with reconversion of defense-related industry, and other bills in the 95th Congress.

Collective bargaining has a key role in meeting the human challenges of innovation and technological progress at the workplace—and this role must be expanded and strengthened. At the same time, national full employment programs must assure an economic climate in which collective bargaining can flourish. And these national programs must help solve the social and human adjustment problems created by innovation and new technology which lie outside the scope of collective bargaining.

ECONOMIC AND TAX POLICIES

The best way to stimulate industrial innovation is to make sure the U.S. economy is operating at full employment and growing with strong consumer demand and high utilization of the nation's resources. A fully employed economy is also the key to an adequate supply of funds (capital) for business investment. Business

expands more rapidly in a healthy economy with full employment and reasonably stable prices. The latest technology and machinery are brought into the workplace more quickly when business is expanding. Training and education in schools and universities and on-the-job contribute to innovation by raising the quality of labor. Elimination of discrimination and full social and economic opportunity for women and members of minority groups also contribute to a favorable climate for innovation.

What we are saying is the easing business taxes is a poor way to stimulate industrial innovation. Venture capital is not waiting for tax breaks—it is waiting for a healthy expanding economy with profitable markets. We oppose the idea that tax cuts for corporate income and capital gains, tax credits and deductions, innovation subsidies, loan guarantees, accelerated depreciation, loosening of protections for workers' health and safety, and loosening of environmental protections are needed to lure private business into engaging in industrial innovation.

It makes much more sense to adopt selective, expansionary economic policies—fiscal, monetary, employment and training policies—aimed at achieving full employment, jobs at decent wages for all people who are able to work and want jobs. Such economic policies will do more to stimulate industrial innovation than all the tax gimmicks and tax loopholes and subsidies and weakening of regulations to protect the environment and to protect workers.

Across-the-board business tax cuts are wasteful and inefficient ways to stimulate industrial expansion or innovation. Venture capital is not waiting for tax breaks —it is waiting for a healthy expanding economy with profitable markets.

A 1977 Commerce Department draft study by Betsy Ancker-Johnson and David B. Chang on "U.S. Technology, Policy" notes that "There is little, if any quantitative evidence regarding the degree to which new technology is developed faster with this mechanism (a tax credit for investment in plant and equipment) than without it" (page 35).

We oppose the notion that tax cuts for corporations and investors such as expanded investment tax credits, depreciation speed-ups, and capital gains are needed to lure private industry into engaging in industrial innovation. The American labor movement in the past has demonstrated its willingness to support specific tax incentives for a particular industry where there was a documented demonstration of need. But we oppose across-the-board tax incentives which are not targeted to national needs.

Attempts to use business tax cuts as an incentive to innovation also ignore the fact that a healthy public sector and adequate levels of public investment are a necessary complement and catalyst to private investment. The bridges, roads, sewers, research, manpower training, and other investments that are heavily dependent on tax revenue are a major factor in enhancing and underpinning private investments, private capital formation and private sector productivity and innovation.

Similarly we are also opposed to any weakening of health, safety, and environmental regulations as the price for industrial innovation.

U.S. foreign trade and investment policy must be balanced with America's need for jobs and economic progress and industrial innovation at home. Foreign economic policy should be geared to America's need for a strong, growing, and innovative economy.

Unfortunately, massive imports and the export of American jobs, capital, and technology have seriously damaged America's industrial base. U.S.-based multinational corporations have contributed to the massive transfer of technology and transfer of innovative activity from the United States to foreign operations. These transfers have caused loss of jobs, loss of workers' skills, loss of technological superiority in some fields, and loss of incentives to innovate.

Increasingly in recent years, the operations of multinational firms—not only through direct investment, but also through licensing of patents and equipment and through trade transactions which include "turnkey" operations which export managerial know-how as well as sophisticated equipment and skills—have transferred technology to other nations. The result is to discourage innovation at home and to stimulate innovation abroad.

No precise measure of these technology transfers is maintained by the U.S. Government and there is no precise measure of their impact on the U.S. economy. But the transfer of technology through licensing, patent agreement, managerial expertise, and managerial know-how is rising.

The only measure published is transactions in royalties and fees—$3.6 billion was paid to U.S. firms in 1974, mostly by relations with affiliates abroad, and that was up 67 percent from the $2.1 billion paid in 1970. Income of U.S. firms from selling technology to the Soviet bloc has more than tripled from $4 million in 1970 to $13 million in 1974.

America is witnessing the export of its future technological base, the base for industrial innovation. That includes investment in new machinery essential to improvements in productivity. It also includes the know-how of a design or process and the know-how that makes the design possible.

Occupational training and retraining may perhaps help displaced workers acquire new skills and new jobs —but there's no assurance that such new jobs won't be at lower skill levels and at lower pay. Furthermore, the loss of an industry and the skills and know-how that go with that industry diminish the essential diversity and pluralism required for a healthy economy and healthy society.

A workforce with the skills and know-how to build factories to produce new machinery, to install it, and to make the process work and to keep the machinery running, as well as to provide services, is a critical part of America's future. These jobs and skills are being exported.

Multinational corporations are not all American nor even primarily American. The Communist countries and state-planned industries operate worldwide as multinational firms. Foreign direct investment and tech-

innovation. Venture capital is not waiting for tax breaks

nology transfers are occurring in the reverse direction today—as firms and banks abroad have taken over U.S. enterprises or invested in the United States.

But this exchange is not a two-way street. Foreign direct investment in the United States in 1974 totaled a book value of $22 billion while U.S. foreign investment had a book value of $118 billion. Furthermore, as in trade, many other nations have regulations and internal laws which restrain the outflow of their capital and technology while the United States continues to preach "free trade."

U.S. tariff and tax provisions encourage export of technology at the expense of U.S. taxpayers, workers, communities, and the nation's industrial base—specifically foreign tax deferral, foreign tax credits, DISC tax deferrals, and Tariff Code Items 806 and 807.

Managers of global multinational corporations should *not* be decisionmakers for U.S. national policy on technology and international transfer of technology. The U.S. Government has the right and the duty to regulate the flow of capital and technology and scientific and managerial know-how.

What is needed? An end of preferential tax treatment for multinational corporations' foreign operations. Comprehensive monitoring of multinational operations to measure precisely their impact on employment, investment, and productivity. Regulations of the export of the most advanced equipment and industrial plants. Regulation of the export of American capital and technology. Regulation of imports into the U.S. economy to help secure American jobs and to assure America's future as an economy with a strong and innovative industrial base.

WORKERS' SAFETY AND HEALTH, CONSUMER PRODUCT SAFETY, AND ENVIRONMENTAL REGULATIONS

We see no conflict between industrial innovation and laws and regulations to protect the safety and health and environment of American people as workers, as consumers, and as citizens generally. Of course, some so-called "technological improvements" such as the "hot-wire chassis" for TV and radio sets may be shortsighted, dangerous cost cutting which may pose safety threats to both workers and consumers—but such problems must be regarded as challenges and opportunities for more safety-oriented innovation. This has occurred in the United States in the past and will continue.

We agree with the September 18, 1978, DPR Work Plan "Issue/Option" statement that "The growth of firms engaged in environmental activities shows that environmental, health, and safety regulations can benefit innovation, the economy, and employment."

We have no quarrel with efforts to reduce uncertainty regarding the timing and direction of future regulatory actions. We have no quarrel with efforts to reduce the lead time associated with the introduction of new products or processes. We support efforts to reorient R. & D. budgets from improved process efficiency and product development to environmental controls. And we support development of Federal programs to help develop environmental, health, and safety technologies.

But we strongly oppose the persistent efforts of business, big and small, to undermine, to weaken the laws and the regulations aimed at protecting consumers, at getting greater protections of workers' health and safety on the job, and at protection of the environment for all Americans. We consider the drive for so-called "voluntary standards" as one part of this campaign.

Unfortunately, from the day the Occupational Safety and Health Act was signed into law, supposedly respectable business organizations, joined by far-right-wing groups, have tried to weaken, to undermine, and ultimately to destroy the law. As part of its all-out attack on OSHA, the business community continues to fight OSHA inspectors' access to the workplace, and to fund a series of legal actions, harassment tactics, to nearly every standard OSHA comes up with.

Likewise, the business community—the U.S. Chamber of Commerce, the Business Roundtable, and the National Association of Manufacturers—waged an intensive and successful war against passage by the 95th Congress of legislation to set up a Federal Consumer Protection Agency.

When it comes to the lives and well-being of workers, consumers, and citizens generally, we don't accept any dollar trade-offs. We believe that ignoring rather than eliminating environmental, occupational safety and health, and consumer product hazards is far more costly to the economy and to society than any possible immediate corrective costs. Looking at the problem in dollars is simple—and simple-minded. Economists can tell us what the costs of cleaning up the environment and the workplace are now. They cannot tell us what the long-range cost of failure to eliminate life and health hazards will be in dollar terms or in human terms.

We support setting of "technology-forcing" standards to reduce toxic materials in the workplace with the intention of forcing regulated employers to innovate—to come up with technology which will achieve the health objectives of the standards.

In fact, there is an urgent need to increase the OSHA compliance force to at least 3,000 Federal inspectors and industrial hygienists and there should be additional manpower available for standards development, statistics, education, and training. We need assured access by OSHA inspectors and vigorous enforcement to spur innovation by business in putting occupational safety and health measures into effect.

To stimulate further innovation in occupational safety and health, the National Institute for Occupational Safety and Health must get substantial increases in funding and manpower for training personnel in the health professions to alleviate the serious nationwide shortage of qualified workers in this field and to perform scientific research and to develop health effects criteria on human exposure to toxic materials. In this connection, we note the need for more adequate safety and health protection for agricultural workers who have a high injury rate and high exposure to toxic pesticides and herbicides.

Environmental requirements and consumer product safety requirements and worker-safety-health requirements can be reconciled with the needs of the national economy without sacrificing either the environment or a healthy economy. Advancing technology makes possible development of clean energy sources and realization of the nation's environmental objectives. In those rare cases where there is an equally important but conflicting objective, such as energy production, any stretch-out in timetables to achieve environmental goals should be kept to an absolute minimum. We insist that this must be an adjustment solely of timetables and not of goals.

PROCUREMENT, PATENTS, AND DIRECT R. & D. SUPPORT

We support Federal procurement policies which will —as the September 18, 1978, DPR "work plan" indicates—result in "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."

Where patents have clear social benefits in terms of protecting the public interest in the environment and safety and health of workers, we believe the public interest should take priority over protection of private rights. By this we do not mean that private rights in such patents would be ignored or nullified, but rather that there would be assured utilization of patents with clear social benefits. One possible approach would be compulsory licensing of such patents with fair compensation to the patent holder. Licensing of such patents should be aimed at maximizing the opportunities for social benefits and avoiding nonutilization of such patents.

However, we also recognize that there is a great potential in distribution of procurement and R. & D. funds for channeling these funds to the biggest corporations and thus further fostering monopoly and waste and adverse effect on the geographic location of facilities. The impact on the nation's economic and social institutions can be profound. Scientific and technological progress must be sought for urban, environmental, and social problems as well as for military and aerospace needs.

We recognize and accept the power of Federal Government procurement policy to create an assured big market, a planned government market pull, to promote socially desirable innovation—such as solar-powered batteries and other innovative items.

Furthermore, we insist that patents created by private business with U.S. taxpayers' dollars must not become private proprietary rights of private business. Title to such patents should be held by the United States and should be placed in the public domain under royalty-free cross-licensing provisions.

We also support legislation to prohibit requirements by private industry that employees waive to their private employer their rights to inventions they may accomplish while employed by that employer. And we oppose any efforts to raise patent-filing fees.

Workers in private industry—whether they be scientific, professional, or technical or whatever their occupational status—should have more incentive, more rewards for inventive or innovative creation that goes beyond their normal duties and responsibilities. They need and they deserve the incentives and the recognition that stimulates extra, creative efforts. Therefore, we support legislation along the lines of H.R. 2101 introduced by Congressman Moss in the 95th Congress to establish the rights of employees in certain inventions that are closely derived from the employee's job or that can reasonably be connected to the job and to establish the employer's duty to compensate the employee when the employee's invention goes beyond the ordinary boundaries of the job. Of course, any other invention produced by the worker on his own time or unrelated to his job should be the property of that worker.

INFORMATION

In general, we support public and private efforts "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." (DPR work plan, Sept. 18, 1978).

However, we strongly urge development of policy guidelines on international flows of information to stop what is essentially a one-way flow of scientific and technological information—out of the United States to foreign nations, including the Soviet Union and Soviet bloc nations.

As we noted earlier in remarks on the export of capital and technology and managerial know-how by short-term-profit-seeking U.S. multinational corporations, a serious problem exists in terms of deliberate export of innovation-stimulating knowledge and processes and equipment. Short-term profits and short-term balance of payments problems are wrongly used to justify a long-term undermining of the U.S. competitive position in the world economy.

We are also very much concerned about the easy access of U.S.-developed scientific and technical information, much of it with national security implications, to other nations, including nations hostile to American society and to the American form of government.

Too often we are given simple slogans about "free trade in ideas" instead of serious consideration of the one-way nature of diffusion of America's scientific and technical information available through a wide variety of publications and computerized information sources. In a free society, there are no simple solutions to this problem, but certainly we must wrestle with the problem and come up with some better answers than we have so far. At the very least, the United States should insist to foreign nations on quid pro quo exchange of information and quid-pro-quo access to scientific and technical and other innovation-stimulating information.

INDUSTRY STRUCTURE AND COMPETITION

R. & D. is highly concentrated in the private sector. One hundred big companies account for 80 percent of industry R. & D. Eight account for 35 percent—General Motors, IBM, Rockwell International, Ford, Lookheed, A.T.&T., General Electric, United Technologies, General Dynamics, and Boeing.

And yet, innovation in America may depend far more on the health of smaller, high-technology companies than on the well-financed, highly organized operations of the corporate giants which dominate the U.S. economy to an extraordinary degree.

Unfortunately, comprehensive information on the structure and operations of these giant corporations is woefully lacking. Much more adequate public disclosure of basic economic information about these quasi-public private corporations must be forthcoming, going far beyond the quarterly line-of-business reports required by the Federal Trade Commission and the Form 10-K reports required by the Securities and Exchange Commission.

A full-scale congressional examination of the American economy is urgently needed to provide Congress and the public with facts on innovation and the role of big business in advancing and/or retarding innovation in the United States. There are precedents for such congressional investigation in the 1930's studies by the TNEC (Temporary National Economic Committee), and in the congressional investigations conducted by Senator Estes Kefauver and Senator Phil Hart.

A new congressional investigation should develop the facts on such economic developments as business mergers, interlocking relationships among giant corporations and banks, their domination of key parts of the national economy, their effects on prices and America's position in the world economy, and their impact on American communities and democratic institutions.

Some business mergers have been aimed at acquisition of innovation—others at suppressing innovation. And some mergers generate inflation as acquiring corporations raise prices to justify inflated (watered) stock prices. We need to get the facts on such corporate activities.

In the meantime, existing information and knowledge justify immediate action. More controls on business are needed to protect the American people against the dangers of unchecked corporate power. Such controls may reasonably include Federal chartering of big corporations with assets over $10 million; more regulation of interlocking directorates, strict enforcement of financial reporting, including corporate product-division and line-of-business reporting; enactment of antitrust legislation to enable consumer business, and government victims of price fixing to recover triple damages even if they were not direct customers of the big business price-fixing violators; and specific antitrust legislation aimed at concentrated and interlocked industries.

SOCIAL ENVIRONMENT FOR INNOVATION

The cultural and social values of the American people are much more significant in determining the pace of innovation than any of the other factors discussed in this paper or listed in the September 18, 1978, DPR work plan.

The independent, creative spirit of a free people in a free society characterized by basic democratic political and social and cultural institutions is fundamental. Without exaggerating the degree of individualism of the American people and the degree to which we have an open society, it is reasonable to believe that these and other noneconomic factors are far more important than economic factors in determining the pace of innovation.

Furthermore, if we measure total U.S. output intelligently, we will, in our full accounting system, recognize the social benefits from protecting the environment and protecting the health and safety of our citizens. We will recognize output gains and productivity gains in the service sector and the government sector. We will recognize the output and productivity gains taken in the form of increased leisure and better quality of life. And we will recognize the need for public investment and public innovation in social goods and services as well as the need for private investment and private innovation.

Advances in knowledge, diffusion of knowledge, rising expectations, improvements in nutrition and health, changing patterns of family life, elimination of discrimination, widening opportunities for citizen participation in economic, political, social and cultural life, and opportunities for workers to participate through their unions in influencing the quality of life on the job and life off the job—all these have innovation effects which are difficult, perhaps impossible to measure, but which are, nevertheless, highly significant. For example, education and the advance of knowledge account for some 40 percent of the nation's economic growth according to one productivity expert's estimate.

We strongly recommend that any "grand plan" for stimulating innovation in the United States recognize the points we have just made and include proposals for strengthening these important influences in American life.

Additional Statement of Daniel Luria, UAW

The United Auto Workers must dissent from the Labor Advisory Subcommittee report's treatment of international trade and technology issues. While we strongly agree that workers and communities displaced by foreign imports and other sources of economic dislocation should be fully compensated for any and all losses suffered, we do not endorse calls for restriction of imports or of trade in technology and information.

Specifically, the UAW does not agree with the inclusion of multinational corporations' policies on the list of causes of recent higher inflation and reduced productivity growth (p. 3). The same goes for innovation: the current regimen of relatively free trade and unfettered transnational investment activity has been fairly neutral with respect to incentives to innovate (p. 13). Nor can we endorse the notion that liberal policies in the field of international commerce encourage the export of skills and of design know-how (p. 14), or the prescription of import restrictions (p. 15). In the UAW's

view, it is not the *outcomes* of U.S. trade policies—job loss, payments deficits, etc.—that merit criticism, but their *causes*: foreign tax deferral, credits, etc. The report's treatment of these causes is on the mark; its repeated attacks on their outcomes, however, does not seem to us as a useful approach.

Fnally, we cannot lend our name to blanket denunciations of "information transfer" (pp. 21, 22). While regulation of the investment behavior of U.S.-based multinational corporations is eminently desirable, restrictions on the flow of scientific and technical information and know-how are not: in fact, the U.S. economy benefits, rather than suffers, from improvements in the economic dynamism of our trading partners.

In all other respects, the UAW is proud to be associated with the Labor Advisory Subcommittee's report.

PUBLIC INTEREST SUBCOMMITTEE REPORT

industrial innovation

Policy Paper

Domestic Policy Review of Industrial Innovation

Advisory Subcommittee on Public Interest

Jack Conway—*Chairman*
February 15, 1979

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FOREWORD

A number of individuals from the "Public Interest" community—from consumer, environmental, civil rights, and community development organizations—were asked to participate in an Advisory Committee on Industrial Innovation to make recommendations for improving the rate and economic significance of industrial innovation in the United States. Before addressing the substantive concerns of that endeavor, we would offer a few words about the structure and operation of the Advisory Committee based on our experience.

Efforts to incorporate public participation in government decisionmaking are of relatively recent vintage. To the credit of the Commerce Department, this particular Advisory Committee was characterized by some important innovative approaches.

Nevertheless, some problems remain. An analysis of our experience serving on this Advisory Committee can build on the creativity of the Commerce Department's efforts to facilitate and improve public interest participation in government.

First, we commend the Department of Commerce for involving representatives of the public interest from the beginning of the process. The Public Interest Subcommittee was given a twofold advisory role: to produce its own report and recommendations and to comment on the recommendations of the seven subcommittees made up of representatives from industry. Many previous Advisory Committees had limited public interest participation to the latter, responsive role.

Second, we regret that the Department of Commerce did not take greater advantage of that early participation. As the advisory process was organized, it unnecessarily restricted consideration of the public interest contribution.

The full Advisory Committee on Industrial Innovation was divided into subcommittees. There were seven specialized subcommittees that were composed entirely of representatives from industry. Those industry subcommittees produced seven reports on seven different subjects. Representatives of the public interest and organized labor, on the other hand, deliberated in separate subcommittees and each produced a separate report. As requested by the Commerce Department, those reports and recommendations were broad in

scope. They spanned many of the substantive areas considered by the industry subcommittees. They also considered many areas that industry failed to consider or that fell outside of the more narrow charges given to the industry subcommittees.

Having established this potentially creative structure, the Department of Commerce failed to reap its benefits. While a public symposium was convened to allow industry, government, labor, and the public interest to discuss and evaluate each of the seven industry reports, no such forum was provided for the Public Interest report. The members of the Public Interest Subcommittee repeatedly requested that a separate symposium or comparable forum be held in which the framework for assessing public policy on innovation and the recommendations for improving innovation developed in the Public Interest report could be discussed. The Department of Commerce repeatedly denied those requests. In our view, this precluded several potentially productive recommendations from receiving full consideration.

Third, there is the problem of resources. The Public Interest Subcommittee had a huge task. It was asked not only to make its own recommendations, but to comment on all seven areas of specific expertise covered by the seven industry subcommittees. The Department of Commerce did recognize that it is often impossible for representatives of the public interest to devote much time and resources to activities that do not fall within the stated missions of their organizations—missions that it is the intent of their contributors to support. In recognition of this problem, the Department of Commerce did provide one paid staff person to assist the subcommittee. But that was not sufficient. Particularly in the short period of time after the issuance of the industry reports, when seven responses on seven different subjects had to be prepared simultaneously, the efforts of one staff person did not allow for the depth and expertise of response from the alternative perspective of the public interest that could be most helpful in the subsequent government deliberations.

We recommend that future advisory processes provide additional staff in the short period in which detailed responses to industry proposals must be developed. The time for response should also be lengthened. Two weeks are not sufficient. In addition, we recommend that an honorarium or per diem be paid to participating Committee members who are from public interest organizations or who are representing the public interest as individuals. In that way, greater time and effort can be devoted to the advisory committee process without undue drain on limited, usually contributed, organizational resources.

We make these criticisms and recommendations for the future in a spirit of cooperation and hope. The Department of Commerce has made an important contribution to the evolution of public participation in government. We appreciate having had the opportunity to serve on the Advisory Committee on Industrial Innovation and we look forward to continued and improved cooperation between government and representatives of the public interest.

INTRODUCTION

It is widely recognized that innovation in the business sector usually takes place at the level of the firm. For most business innovations the marketplace is the most important stimulus.

This domestic policy review, however, is concerned with something apart from that innovation which is called forth by the marketplace as it operates today. This domestic policy review is concerned with additional action to promote innovation that might be taken by *government*. When government takes a role in promoting innovation in the business sector, it also assumes a responsibility. It is the responsibility of government to ensure that the innovation it promotes through public policy and public monies conforms to its legal mandates and furthers the congressionally-directed missions of government.

The Public Interest Subcommittee submits that any proposed government role in the innovation process should be subject to public scrutiny. Such a scrutiny would determine whether the proposed government role will promote a type of innovation that will advance the goals of our society; it would determine whether innovations thus promoted will fulfill the basic social and human needs of citizens. The first section of this paper, "Assessing the Benefits of Innovation," is devoted to the development of a framework for judging policy alternatives according to these criteria.

The remainder of the paper is devoted to "Directions for Public Policy." In this section the Public Interest Subcommittee makes several recommendations for government actions to promote innovation—innovation within the framework of society's goals.

Conspicuously absent from this Public Interest paper are recommendations for lessening the regulatory "burden" on business, or for additional tax incentives to encourage business innovation. Yet these themes are so prevalent in the papers prepared by the industry subcommittees that at least a brief comment is required here.

We do not accept the widely held industry assumption that regulations impede innovation. (See the response to the Industry Subcommittee Report on Environmental, Health and Safety Regulation for a detailed refutation of this assumption.) Industry's frequent assertion, in this and other forums, that regulations are a drag on the imagination and entrepreneurship of business do a disservice to the creativity of American business. Such assertions provide too easy an excuse for corporate inaction, a reason for ignoring what business management itself might do, independent of government actions, to give priority to innovation consonant with people's health and safety.

Regulation must be viewed as producing a very important stream of benefits—health, safety, and environmental quality. The existence of these regulations is an important incentive to innovation. The regulations are the manifestation of a public demand for increased health and safety—expressed through government for lack of any market mechanism that would reflect that demand. Like any other expression of demand, they provide a channeling or direction to

innovation, an opportunity to make a profit by devising a creative means to fulfill that demand. If there is a lag in innovation today, it is a lag in the response of American business to the pull of regulation; it is a lag in serious effort on the part of business to create innovative products, processes, and solutions to meet human, environmental and social needs. That innovation lag should be a priority focus of this domestic policy review.

The use of generalized tax incentives to promote innovation is the other theme of critical concern that emerges from the various industry papers. In our judgment, many generalized tax policies lead to innovations that do not meet the basic needs and priorities of society—but that are very costly to the taxpayers. Not only should proposed new tax incentives be carefully scrutinized, but existing investment tax credits and tax policies involving large, off-the-budget tax expenditures should be reviewed, and their implications for the direction of innovation should be assessed.

There are two additional themes of overriding importance that are touched upon at various points in this Public Interest paper. The first is the need for a vigorous, competitive industrial structure. The second is the importance of full employment and job security. Both are prerequisites for innovation, conditions without which any other incentives to innovation will have slight chance of success.

Business concentration is inimical to innovation. Study after study has shown that the largest share of industrial innovation comes from individuals and small businesses rather than large corporations. Smaller enterprises must be more responsive to the needs of consumers to survive. Small enterprises have the flexibility to perceive and act upon opportunities for innovation based on society's needs. The insurance of a vigorous competitive structure of industry, which allows these innovative businesses to flourish, is both an appropriate and a critical role for government.

This Subcommittee feels compelled to point out that the best incentive for increased innovation in the private sector would be a healthy, growing, full-employment economy. Only in such an economy do enterprises, particularly the smaller ones who provide the bulk of new innovation, have the resources and confidence to take the risk that innovation requires. Efforts to stimulate economic development, particularly in industries and areas where it is currently lagging, are essential to increasing innovation.

Moreover, job security is a fundamental aspect of innovation. Frightened workers, worried about whether another job will be available if a specific new idea is implemented, often oppose innovation. Men and women who know that other jobs of a least equal quality and pay are available not only accept, but help foster innovation.

Yet job security itself depends on overall economic planning for full employment. Full employment—and targeting of productive jobs to specific communities—must be a major priority of any innovation policy.

The following Public Interest perspective on innovation is organized into three sections.

The first section develops a framework for formulating public policy on innovation. The members of the Public Interest Subcommittee view this as their most important contribution to the policy review process. The use of such a framework is critical if public efforts and funds are to be directed wisely and efficiently.

The second section proposes several policy directions that might be used to promote innovation within the framework of society's goals. Our recommendations are intended to be helpful and suggestive; they are certainly not exhaustive of the means that could foster innovation within that framework.

Finally, the third section responds to each of the papers prepared by the Industry Subcommittees.

ASSESSING THE BENEFITS OF INNOVATION

From the public interest perspective, the *rate* of innovation is subservient to the question of the *direction* of innovation. While there may or may not be a problem with the rate at which society is innovating, we detect distinct problems with the social and economic significance of present innovations.

The Public Interest Subcommittee, therefore, proposes an overall framework within which any recommendations for improving innovation can be considered. It is a framework for formulating public policy, a way to assess the government role, if there is to be any, in promoting or inhibiting innovation.

If the Government is to take any role in promoting innovation in society, it is only proper for it to do so *after* answering the question: Innovation to what end? Government must also answer the subsidiary questions: How does the type of innovation that is being promoted relate to government missions as defined by law? Does the innovation being promoted improve the quality of life? Is that improvement widely distributed among the various groups in society? And, who are the beneficiaries?

SOCIAL/LEGAL GOALS OF SOCIETY

These questions can best be addressed by starting with the basic goals of our society, for it is these goals that define the direction that innovation should take. They represent the ends to which government efforts to promote innovation should be directed. Some of these major goals, in no particular order, are:

- Good health and safety throughout every individual's life
- Employment for every person who desires it, for as long as he or she desires it
- Adequate income

- Improved equity of income distribution
- Adequate housing
- Adequate, nutritional food
- A clean and decent environment
- Equality of opportunity
- A more democratic structure of society, industry, and community, and even
- Enjoyment and pleasure in life.

These goals are social and ethical goals, but they are also the legal goals of our society. They are goals that have been reaffirmed repeatedly over the years, and, in many cases, they have also been formalized by legislation. The Clean Air Act, the Water Pollution Control Act, the Consumer Product Safety Act, the Occupational Safety and Health Act, the Full Employment and Balanced Growth Act, the Civil Rights Act, the Equal Pay Act, the Community Service Act, and the Housing and Community Development Act are just a few of the laws that embrace and implement these goals. The goals also define the mandates and priorities of several government agencies. Yet all too often we find that these goals are slighted and even lost in the process of decisionmaking based on what policymakers see as "economic imperatives."

THE NEED FOR SOCIAL INDICATORS

Economic data or economic indicators are important as one measure of the effects of innovation on society. But measuring progress toward "economic" goals such as employment growth, improved productivity, improved balance of trade, and a stable price level tells only a part of the story, a fraction of what one really ought to know. Those economic indicators tell us *how much* difference increased innovation can make or is making in the economy.

The other parts of the story must be provided by social indicators. The use of social indicators, measuring progress toward society's goals, are necessary to tell us *"how well"* and *"for whom"* innovation works. They can tell us the way in which progress toward the economic goals changes the quality of life, and for whom those changes are occurring. We would insist that in evaluating the effectiveness of efforts to enhance innovation, and particularly of *government* efforts to enhance innovation, the "how well" and the "for whom" are equally, if not more, important than the "how much."

To better define "how well" and "for whom," the Public Interest Subcommittee strongly supports the development of good, quantifiable social indicators. When we talk about costs and benefits to society, we must speak a common language. The magnitude and import of policy decisions being made today about our lives and our environment demand high priority for work on social indicators.

These dimensions are, admittedly, more difficult to measure than what we call economic data. But it is also true that a lot less effort has gone into trying to measure them. In the 1960's, various commissions and advisory groups—including the National Commission on Technology, Automation and Economic Progress—stressed the importance of social indicators. Much of the academic background work was also done in the late 1960's and early 1970's.[1] But the effort has never been given the priority, and the Government resources comparable to those expended for development of economic indicators, that are needed to make possible the use of social indicators in policy decisions.

We are fully aware of the reality of decisionmaking today. If you can't count it, as the saying goes, it doesn't count. While this may be the reality, it is not the necessity. Those who would promote innovation should not be willing to settle for the status quo in measuring the effectiveness of that promotion.

But we also would point out that it is often necessary to count that which cannot be counted. Social indicators such as we are proposing here can differ from economic indicators. Information does not have to be totally quantifiable to be important and useful. Qualitative and descriptive information should play an equal role in evaluating public policy.

Even in measuring the "how much" of innovation, great caution must be exercised. There is also substantial room for improvement in our society's use of economic indicators to measure the effect of innovation.

IMPROVING ECONOMIC INDICATORS

The "economic" benefits of innovation have never really been measured. The reasoning about the presumptive benefits usually goes as follows: innovation is assumed to lead to the establishment and growth of "technology-intensive" industries. Some research has shown that "technology-intensive" industries have greater employment growth, greater labor productivity growth, and contribute less to inflation than do industries that are less "technology-intensive."[2] In addition, these technology-intensive industries have a positive trade balance, as compared to a negative one for other industries. By inference, innovation is assumed to lead to the characteristics of growth, employment, productivity, stable prices and trade advantage—all of which are positively valued. Innovation, the line of reasoning goes, must therefore be good, and furthermore, the more there is of it, the better off we will be.

There are several problems with that type of reasoning.

(1) Innovation is not synonymous with technology. The thinking about innovation should not be limited to the products of the frontiers of science and engineering, nor even to the diffusion of new types of hardware. For example, the development of the theory of "management by objective" is a human-oriented rather than a technology-oriented innovation that has had a marked impact on industrial behavior. To take another example, it is difficult to imagine any innovations in highway and automobile engineering that could have pro-

[1] See, for example: Bertram M. Gross, *The State of the Nation: Social Systems Accounting* (London: Travistock Publications, 1966); and Judith Innes De Neufville, *Social Indicators and Public Policy,* (Amsterdam: Elsevier Scientific Publishing Company, 1975).

[2] Michael Boretsky, U.S. Department of Commerce.

duced such savings in fuel and particularly such savings in lives as has the social/legal innovation of the 55 miles per hour speed limit. Innovation encompasses not only "hard science" technology, but also changes in our methods and institutions.

(2) The most intensive use of technology may not always produce the best result. A comparison of San Francisco's completely automated BART mass transit system and Washington, D.C.'s partially automated METRO provides an intuitive confirmation of the validity of questioning the prevalent "some is good, more is better, most is best" mentality regarding technology.

(3) The use of changes in labor productivity as a measure of performance gives the greatest credit to those operations that have substituted machinery for people. Its use builds in a bias to capital-intensive production. If the multiple factors affecting productivity were considered, the most efficient mix of capital, labor, materials, and energy could be evaluated.

Furthermore, the measurement of productivity in the economy, as the dollar value of all goods and services divided by the hours that were spent to produce them, does not differentiate in any way except cost between final products. Output of a breakfast cereal that looks like a cookie and housing units for low-income people are given equal weight. Productivity measured in this way tells us very little about how well we are using the nation's resources.

(4) Industry growth, employment growth, labor productivity growth, and export growth are not necessarily positive qualities in and of themselves. For example, almost all the growth in employment in recent years has come from small businesses.[3] If the type of growth that leads to increasing scale of production is encouraged, employment may be depressed. It certainly matters what types of industries are growing, and what types of exports are being made, and in which industries employment is being created. Policies that encourage the rapid growth of high technology, capital-intensive, energy-hungry industries at the expense of others will encourage a type of growth that often has other, negative, consequences for the larger public interest.

In the last 30 years, for example, in agriculture, industry and transportation, those productive processes that use energy least efficiently have been growing most rapidly, driving their energy-efficient competitors off the market. In agriculture, the older, energy-sparing methods of maintaining fertility have been replaced by the intensive use of nitrogen fertilizers synthesized from natural gas. In industry, synthetic fibers, plastics and detergents, made from petroleum, have captured most of the markets once held by wood, cotton, wool, and soap—all made from energy-sparing and renewable sources. Thousands of separate entrepreneurial decisions that have been made in the United States regarding innovation and new productive enterprises in the last 30 years have, with alarming uniformity, favored those that are less efficient in their use of energy and capital and more damaging to the environment than their alternatives.[4]

Care must be taken that government efforts to enhance innovation do not reinforce this trend, but rather look for creative means through which it can be reversed.

"PUBLIC ACCOUNTING" FRAMEWORK

The Public Interest Subcommittee calls for the development and use of the concept of "public accounting." A "public accounting" would be a complete accounting, addressing all three measures: how much, how well, and for whom. Public policy initiatives to promote innovation should be subject to "public accounting," and so should corporate economic decisions as they determine the availability of socially oriented innovations—*particularly when those innovations have been or will be promoted by government subsidy or aid of any kind.*

The use of this "public accounting" for choosing and selling priorities and for evaluating the effectiveness of means to promote innovation is illustrated schematically in figure 1. A few examples of how it can be applied are in order here.

The public commitment to a workplace in which a worker need not fear disability or death as a result of his or her occupation through the Occupational Safety and Health Act typically receives one kind of measurement—the cost of implementing conditions that provide such a safe workplace. These costs are often said to impede innovations, through substituting for what industry claims would be more productive expenditures.

A public accounting would measure these costs, *but it would also measure the costs of not providing a healthy workplace.* The costs of workers' compensation and unemployment insurance and disability and survivors' payments would be measured. The costs of labor turnover and absenteeism and the costs of reduced productivity to both the firm and society would be measured. The costs of reduced morale among workers would be considered.

The public accounting would also consider the cost of disease. For example, the GAO estimated that cancer alone costs $15 billion annually[5]—and HEW reports that 40 percent of cancers can be traced back to the workplace. The accounting would consider the costs of inflation in insurance and medical bills, and it would try to consider the often unimagined costs that are imposed on future generations. Such a public accounting might even consider the subtle disabling effects of a poor work environment, which makes a worker less likely to participate in community affairs and less likely to vote.[6]

When we speak of the costs of providing a safe, healthy workplace, then, a public accounting would remind us that the costs of not providing such a work-

[3] "Future of Small Business in America," Report, House Committee on Small Business, Subcommittee on Antitrust, Consumers and Employment, November 9, 1978.

[4] Barry Commoner, the *New York Times,* November 20, 1974.

[5] GAO. "Federal Efforts to Protect the Public From Cancer Causing Chemicals Are Not Very Effective," June 16, 1976, p. 1.

[6] Bertill Gardell, "Psychosocial Aspects of the Working Environment," *Working Life in Sweden,* No. 1, October, 1977.

Figure 1.—Applying Social and Economic Indicators in Setting Priorities for and Evaluating Effectiveness of Efforts to Enhance Innovation

Choosing, Setting Priorities	**Evaluating Effectiveness of Means**
TO WHAT END	**HOW WELL**
	FOR WHOM
Social/Legal Dimensions	**HOW MUCH**
Health and safety	Economic Efficiency Dimensions
Employment for every person desiring it	
Adequate income	Employment growth
Improved income distribution	Improved productivity
Adequate housing	Improved balance of trade
Adequate nutritional food	Stable price level
Clean and decent environment	
Equity of opportunity	
Enjoyment and pleasure in life	
More democratic structures	

place can extend from workers' compensation all the way to the weakening of *democratic* institutions.

To take another example, across-the-board tax reductions or untargeted investment incentives, granted on the theory that business is anxious to innovate but simply does not have sufficient profitability or cash flow, would not fare well in the accounting. If greater innovation would indeed be the result of such policy—which is itself questionable—the innovation would not pass the priority criterion of "to what end" or the effectiveness criteria of "how well" and "for whom." The "innovations" supported by such a policy might be of an all too familiar genre—a synthetic potato chip, or a cigarette of a different length, or an electric hot dog cooker or a "drier" deodorant. If in looking at what our foregone tax dollars might buy we ask "innovation to what end," and "how well" and "for whom," we can easily see that we make a questionable investment of public money when we support such activities in the name of innovation. The Public Interest Subcommittee argues that public efforts to enhance or increase innovation in industry should be directly targeted to innovations that will move the society closer to the fulfillment of the goals set forth in the social/legal framework above. A "public" accounting of the effects of any such efforts or policy is necessary. In providing a "public accounting," we need both an economic efficiency dimension to tell us how much difference a policy may make on the economy, and an ethical dimension to tell us the way such increases in the economic efficiency variables change the quality of life and for whom the changes are occurring.

Efforts, like those mentioned above, to promote increased innovation through the relaxation of regulation or through untargeted tax incentives are policies that show a distinct loss under a "public accounting." They should not be the direction that government efforts to increase industrial innovation should take.

We will turn now to examples of policies to encourage innovation that we believe would show a profit for society.

There are several means by which the Government could stimulate innovation in the economy. These are means that can be directly targeted to priority areas. Most of these efforts involve institutional changes rather than large expenditures by the Federal Government. There is certainly room for government expenditures on basic and applied research that is not being supplied by private industry in priority areas, and even room for government expenditures on "yardstick" corporations and similar endeavors. But the provision of an institutional framework conducive to innovation or the institutional support for organizations committed to innovation can also be very effective. To these ends, we submit the following ideas.

DIRECTIONS FOR PUBLIC POLICY

POLICY AND COORDINATION AT FEDERAL LEVEL

If the Federal Government is serious about promoting innovation, then there must be some continuing focus for that effort at a high level of government. Such a focal point—call it an Innovation Office until it has a better designation—could ensure ongoing policies to stimulate and harness innovation as it applies to government missions, those goal areas that the Government is directed by law to pursue. A focal point of this kind could provide information and evaluation

assistance and encourage dissemination of innovations. Through such an office, the Government could even act as a broker for innovation in areas where there is reason to believe that the market is not providing such a service.

Evaluation and Development Assistance

There are some precedents and examples for these types of government activities. During World War II, the Federal Government established an Inventor's Council that received and reviewed 625,000 inventions in connection with the war effort. Important inventions such as the vacuum tube used in radios and mercury dry cell used in batteries came through this route.

A more recent effort to harness the innovative spirit of the country was mandated by Congress in late 1974.[7] Congress directed the National Bureau of Standards to evaluate energy-related inventions and to make recommendations for their support to the Department of Energy. So far 10,000 inventions have been submitted—almost entirely from independent inventors and small businesses. Some 85 or 90 have been recommended to DOE, and about 32 have been given grants averaging about $80,000 each.

The evaluation and initial development assistance given by this program is a first step. At the completion of the government support, DOE hopes that the inventor can assemble, with confidence of success, the people and capital necessary for commercialization and marketing of the product, negotiate a beneficial arrangement with an existing company, or compete effectively in obtaining contracts from other government programs for further development. Presumably the inventor gains from this program not only the initial grant, but a government imprimatur that makes it easier to attract capital and transform invention into innovation, and the Government gains another tool through which increased energy conservation and/or production can be promoted.

Competition and Awards

Another approach that could be taken by an innovation office is the holding of competitions to solve specific mission-oriented problems. Or it could cast a broad net for innovations in several priority areas, with a small award and good publicity for the best ideas. As a beginning, two or three priority areas—such as health, energy, nutrition, and housing, the "basic necessities" of life—could be designated in which to select the top 20 or 30 innovations for the year. The criteria for judgment could follow the public accounting criteria set forth above. Additional criteria such as the number of people who would benefit from the innovation could be added. Under such criteria, preference would be given to an advancement in risk-free food preservation over an advancement in X-ray scanners for specialized use. An energy saving product ready for mass production would be given preference over one that must be custom made.

[7] "The Non-Nuclear Research and Development Act of 1974."

Awards should be given with as much publicity and ceremony as possible. This would serve several purposes. It would provide recognition for the individual innovators. It would serve notice that the Government indeed wants to promote and reward innovations, and that it wants to promote and reward innovation in areas of top social priorities. And finally, as with the energy evaluation program, the publicity and government imprimatur would greatly shorten the adoption and dissemination time of useful new ideas and products.

In designing the evaluation and awards program, some guidelines can be drawn from the Industrial Research/Development magazine (Chicago, Ill.) IR100 Awards Competition, which has given recognition to the 100 best new high technology products for the last 16 years. A limited evaluation of the impact of this contest on adoption and use and on company operations is now taking place at the National Science Foundation.

RECOMMENDATION

An Innovation Office should be established at a high level of government to provide a continuing focus for stimulating and harnessing innovation to fulfill government missions and as a vehicle for evaluation, promotion, and dissemination of innovations in high priority areas.

RECOMMENDATION

The National Bureau of Standards should prepare a paper on the experience of the Energy-Related Invention Evaluation Program to date, including followup on successful inventions, recommendations for program improvement, and opinions on the expandability of the program to areas other than energy. Other government experience in this vein, such as that of the National Transportation Safety Board, should be surveyed and evaluated.

RECOMMENDATION

We recommend that the innovation office to be established consider the selective use of competitions and awards for promotion and dissemination of innovations in areas of need such as health, nutrition, housing, and mass transportation.

EXEMPLARY ROLE FOR FEDERAL GOVERNMENT

There are many ways in which the General Services Administration (GSA)—through procurements, through standards-setting, through testing, through technology-forcing yardstick projects, and through education—can contribute creatively to stimulating technical innovation.[7a]

The GSA already has discretionary authority to set specifications aimed at improving the quality, efficiency, and safety of products it purchases. It can periodically

[7a] Assuming that problems with honesty in the GSA can be solved in a satisfactory manner.

update its specifications, emphasizing, when possible, performance rather than design features, to stay abreast of the best that the market offers and to encourage innovation.

Moreover, it can apply greater resources to produce government-generated specifications as alternatives to those set by industry. The GSA's Federal Supply Service has eight testing facilities but only one develops specifications and standards. The others merely verify whether manufacturers are complying with the FSS specifications.

The GSA's Federal Supply Service and Public Buildings Service often develop accurate testing procedures that are more accurate than those upon which industry's standards are based, as in the case of FSS's method to isolate the lead content in paint. These two divisions should have the authority and responsibility to inform industry systematically about their superior test procedures.

The GSA can serve as a yardstick. It can remind the country of its technical capabilities. Already, the collection and recycling of government wastepaper is exemplary, as are FSS projects that refurbish furniture and retread tires. FSS can set compelling examples, for example, in building repair, and in retrofitting buildings with more energy-efficient heating and cooling systems.

In another vein, imagine the incentive to manufacture air bags if FSS now required passive restraints in the 16,000 vehicles it buys annually and the 6,000 it leases, as well as equipping most of the Federal Government's 80,000 vehicles. By doing this, the FSS would force the 1984 model deadline that the Department of Transportation has set. If the automobile corporations had to have air bags to sell to the Government, they might also make them available to the public. The technical invention called the air bag, which appeared on the scene years ago, would be on its way to becoming a fully developed innovation.

The GSA also has an important educational function to perform. It could share its vast store of useful information about household products with consumers. It could advise on quality of product and on savings. Through its consumer information service, the GSA could publicize its testing criteria for products it purchases, pointing out that other products might also meet these standards. In addition, by expanding its testing operations, it could stimulate competition and industrial innovation. A GSA approbation could be an effective market force.

RECOMMENDATION

The GSA should make greater use of its existing authority to set specifications aimed at improving the quality, efficiency, and safety of products the Government purchases. To accomplish this, it should develop its own specifications and standards rather than relying on those of industry and, wherever possible, should emphasize performance rather than design standards.

RECOMMENDATION

The GSA should engage in technology-forcing yardstick projects, such as retrofitting buildings with more energy-efficient heating and cooling systems and requiring passive restraints on all the vehicles the government leases or buys.

RECOMMENDATION

The GSA should advise consumers on product safety and quality as determined by its testing procedures.

REFORM OF VOLUNTARY STANDARDS-SETTING PROCESS

The voluntary standards to which industry adheres are made by the corporate sector through more than 400 different industry-funded organizations. Major firms tend to dominate the standards-writing process. This gives them great power in determining what standards will be set and exactly what those standards will say.[8] This system has an adverse impact upon competition and the consumer, primarily because the procedures of the majority of the private standards-setting organizations are industry-dominated and do not include minimum due process safeguards.[9]

There are even documented cases in which large companies have deliberately undermined small competitors by persuading standards committees that the small firm did not meet the standard. Later correction under pressure does not help; the small company has already lost the sales.

Nor does the consumer have any power against these standards. For example, the lighting standards to which we adhere are far beyond what is necessary for visual safety, efficiency and/or comfort. Specialists estimate that U.S. lighting can be safely reduced by one-third and the country could save $3.5 billion annually of its total electric bill.[10] Such waste is clearly inimical to innovation, and particularly to innovation in the interest of the public.

To compound the problem, voluntary standards often do not remain a matter of voluntary compliance. Federal, State, and local governments routinely adopt and incorporate privately developed standards in laws and regulations, often after only a brief, inadequate review. The standards thus take on a legal status, and innovation may be further impeded by, for example, building codes based on self-serving standards.

To remedy these problems, the Department of Commerce has advocated legislation that would direct the Federal Trade Commission to write and enforce procedural rules for trade standards groups. Such legislation has been introduced as S. 825, the Voluntary Standards and Accreditation Act of 1977. The Public Interest Subcommittee supports such legislation.

RECOMMENDATION

Legislation should be passed to give the Federal Government, through the FTC, the power to write and

[8] David Hemenway, *Industry-Wide Voluntary Product Standards*, (Ballenger Publishing Co., 1975).

[9] Department of Commerce Report to OMB, 1977.

[10] "Questions and Answers about Trade Product Standards: A Primer for Consumers," prepared for the Subcommittee on Antitrust and Monopoly of the Committee on the Judiciary, U.S. Senate, 1977, p. 5.

enforce procedural rules for trade standards groups. Provisions in such legislation should include:

(1) Full participation of underrepresented interests on standards committees, including small business and consumers. Aid to these groups, such as travel expenses, consulting fees, and technical assistance, should be provided.

(2) Limitation of participation of industries affected by a particular standard to no more than one-third of the committee, for example, with the rest independent of the affected party.

(3) Open access to standards-writing committee meetings, minutes, and records.

(4) Specification of performance standards rather than design standards wherever possible and periodic review to ensure that standards reflect existing or new technology.

(5) Written technical justification for all standards, including minority technical opinions, so that interested parties can understand the premises and research underlying a standard and government agencies have a basis upon which to decide whether to adopt it.

(6) Effective mechanisms for appealing adverse or imprudent standards decisions.

REFORM OF THE PATENT SYSTEM

The broad topic of patents and inventors encompasses four important and intertwined subtopics related in innovation. They are (a) reform of the patent system, (b) the rights of employed inventors, (c) the rights of the lone inventor, and (d) dissemination and use of inventions resulting from an expenditure of Federal funds.

Review and Reform

Our patent laws are ripe for reform. Patents have moved from an inventor's law to an investor's law. Where once most patents were taken out in the name of individual inventors, now most are filed by corporations. At the same time, the value of patents to individuals has been greatly decreased by the frequency with which patents are now invalidated through litigation. Now $50,000 or more is needed to enforce a patent through the courts once it is granted.[11] A remark made by an attorney about the ineffectuality of judicial review of standards would be equally apt here. "My comment is that judicial review is not meaningful. Lawsuits aren't meaningful. A lawsuit should never be fought over a live horse because they grow old and wither and die." [12] An inventor whose patented idea is stolen by a corporation and who seeks judicial remedy is indeed likely to be old and bankrupt before any relief is granted. If the court finds that the patent should have been issued, that is, the Patent Office deemed it sufficiently novel but the court did not, then the inventor is left with nothing.

We recommend that the Government undertake a thorough review of patent law in light of these and other basic criticisms. Participants in such a review should not be limited to members of the patent bar whose corporate clients have many reasons to favor the law as it stands. While questions of fact in patent law usually require a technical background to understand, questions of public policy can be comprehended by any interested, intelligent person, given sufficient time and resources to concentrate on the problem. At a bare minimum, inventors should be given *equal* voice with corporate attorneys in such a review.

Legal Aid

As an immediate, interim measure, steps should be taken to equalize the power between corporations and individuals when a patent becomes a matter for litigation. While this problem of unequal power exists throughout many aspects of our law, there rarely is such a clear problem of one person against a huge organization. Remedies that have grown up to deal with the problem in other areas, such as class action suits, do not aply here. In addition, it is often the individual's livelihood that is at stake. Accordingly, we recommend that some type of sophisticated legal aid be available to persons who find themselves pitted against corporations in litigating patent law.

Employed Inventors

One specific issue regarding patents is that of the rights of employed inventors. The inventions made by the employees of America's corporations nearly always belong to the corporations; it is virtually unheard of in this country to grant an employed inventor any type of right or royalty in his or her invention. A survey discussed at a recent Industrial Relations Institute meeting indicated that some companies offer small, monetary awards and very few others more substantial monetary awards, but none any continuing, right. This is not the case in Germany, where an employed inventor must be compensated in relation to the future value the invention has to the employer.

For the last several sessions of Congress, Representative Moss of California has introduced a bill guaranteeing the rights of employed inventors based on the German model. In essence, it requires negotiation between the employer and the employee on the proper compensation based on the value of the invention, with referral to arbitration if agreement cannot be reached. Hearings have never been held on this measure. Yet hearings on the subject, held either by Congress or by the Commerce Department, with public interest participation, would help determine the extent of both the inequity as perceived by inventors and its possible effect on innovation.

Federally Funded Research

The disposition of patents and the use of inventions resulting from an expenditure of Federal funds are

[11] "Electronics Industry Takes to 'Potting' Its Products for Market," Science, November 1978, p. 849.

[12] Subcomm. No. 5 of the House Select Comm. on Small Business, "The Effect Upon Small Business of Voluntary Industrial Standards,: H.R. 1981, 90th Cong. 2nd Sess. 1968, quoting John F. McKenna, quoted by David Hemenway, "Remarks,: *The Solar Market: Proceedings of the Symposium on Competition in the Solar Energy Industry,* Bureau of Competition, Federal Trade Commission.

also at issue. It is in the public interest to have such inventions in the public domain if they were paid for with public funds. In practice, however, such inventions show a very low rate of dissemination. Government policy toward patents needs to be considered within the larger context of the thorough review and, presumably, reform of patent law recommended above.

RECOMMENDATION

A thorough review of patent law should be undertaken, with attention given to the problems, among others, of the protection of inventors from the power of large corporations and of the increasing frequency of judicial invalidation of patents. Participation in such a review should extend beyond the patent bar to give inventors and the public an equal voice.

RECOMMENDATION

Sophisticated legal aid should be provided to individuals pitted against large corporations on patent matters.

RECOMMENDATION

Hearings should be held on the subject of guaranteeing employed inventors compensation that is related to the value of the invention, and to determine the extent of the inequity that now exists as perceived by inventors and its possible impact on innovation. Legislation such as H.R. 2101, which would guarantee these rights, should be seriously considered.

SMALL BUSINESS AND COMPETITION

In 1966, a Commerce Department study showed that small businesses accounted for more than half of all scientific and technological developments since the beginning of this century. The "Charpie Report" recommended "incentives aimed at encouraging independent inventors, inventor-entrepreneurs, and small technologically based business. The cost of special incentives to them is likely to be low. The benefits are likely to be high." A similar study, conducted by the Office of Management and Budget in 1977 concluded that the same trend applied through the period between 1953 and 1973.[13] A few studies, on the other hand, have failed to find any relationship between firm size and innovation.[14] But any determination of the differing rate of innovation would also have to take into consideration the quality of innovation. One certainly would not find a small business developing a new underarm deodorant and then spending $18 million in 1 year to sell it to the American people, all while a company executive admits "The wetness-stopping properties in Dry Idea aren't any better than competing products. But the consumer thinks it is. It seems to the consumer that it goes on drier. So she thinks it keeps her drier." [15]

Smaller enterprises are typically more responsive to the needs and problems of customers than are very large enterprises. By definition, small businesses are characterized by fewer barriers to entry—particularly in the amount of capital required—so that competitive behavior, including competitive pricing, is mandatory.

On the other side of the coin, there is the nagging question of the relationship of corporate power to the direction and rate of innovation. Large corporations are less flexible. They may not take advantage of impetuses or opportunities for innovation because these may imply many changes in present investments and structure of business. Contrast the multiplicity of small businesses that have sprung up to meet the needs of water and pollution testing and controls [16] with the footdragging of the major auto companies on every subject from passive restraints to the development of an alternative to the internal combustion engine.

Secretary of Transportation Brock Adams, in calling for the reinvention of the car to meet social, environmental, and energy needs, has criticized the auto industry record in this respect: "In recent years the American Automobile Industry, I regret to say, has acquired a reputation for imitation, not innovation. The companies have become collaborators rather than competitors."[17] And there is at least widespread belief that large corporations not only fail to rise to the challenge but actually stifle or bury potentially beneficial innovations that would threaten their investment and market position. Witness, for example, General Motors' deliberate decision in 1970 to slow down the development of air cushion systems for passive restraints.[18]

Despite all of these touted advantages of small businesses in spurring innovation, very little has been done to foster small business for this purpose. One of the best things that Government can do to this end is to foster competition, to protect small business from the often predatory practices of giant corporations.

Anti-Trust

Vigorous enforcement of antitrust provisions now on the books would go a long way. One option is breaking up the horizontal and vertical integration that is so inimical to competition. It is this option that the Congress has debated with regard to the energy companies.

But new tools with which to ensure competition are also necessary. The new forms of power gathering that have grown up in the last two decades—the conglomerates born of merger-madness and the webs of interlocking financial interests—exercise control that lies beyond the reach of current antitrust enforcement, which is based on preventing control of the same or competing markets. Existing antitrust laws do not deal effectively with mergers that threaten to result in the

[13] "Future of Small Business in America," Report. Subcommittee on Antitrust, Consumers and Employment of the House Committee on Small Business, Nov. 9, 1978, p. 7.

[14] Reviewed in James M. Utterback, "Innovation in Industry and the Diffusion of Technology," *Science*, 15 February, 1974, Vol. 183, p. 622.

[15] "Sweating it Out: Time, Risk, Ingenuity All Go Into Launching New Personal Product. Gillette spends $18 million, 2 years on Antiperspirant That Feels Dry to Users," *The Wall Street Journal*, November 17, 1978.

[16] See also Engene Melnitchenko, "Specialty Chemicals as an Investment Alternative," Paper delivered before the American Chemical Society at Miami Beach, Fla., September 12, 1978.

[17] Speech before the Economic Club, Detroit, Mich., December 5, 1978.

[18] Letter of Robert F. McLean to Mr. Frank Turpin, National Highway Traffic Safety Administration, June 14, 1978, with Attachments. Mr. McLean was removed by GM from his position of project manager for the safety air cushion because he was too aggressive in promoting them.

dominance of the entire economy by a few giant conglomerates. Nor do they deal with the financial leverage and power exercised by the huge corporations through interlocking directorates on the boards of financial firms and institutions.

Conglomerate mergers inevitably result in larger and larger enterprises, more and more removed from the shareholders, consumers, employees, and communities that depend on them. "Independent owners of local businesses become Division Managers for distant conglomerates, losing their ability to make independent decisions, or to try new or innovative approaches, without approval."[19] Interlocking financial directorates mean subtle and hidden control of the resources of business, of the decisionmaking on direction of expansion, including innovation. Small business needs protection from these types of fundamental power and control over markets, entry, products, and capital. It needs vigorous antitrust enforcement and the expansion of the concept of antitrust to cover conglomerates and financial interlocks.

Federal Chartering

The Public Interest Subcommittee also advocates the idea of Federal chartering of giant corporations. Federal chartering would provide a framework of rights, responsibilities, duties, and disclosures incumbent upon giant corporations in their dealings with various specific constituency groups—workers, taxpayers, community residents, consumers, shareholders, and small businesses—in exchange for the right or charter to do business. Such Federal chartering would make corporations both more accountable and more responsive to the needs of society.

Without belaboring the details, we would note that the idea of Federal chartering can speak directly to many of the issues discussed in relation to innovation, to problems of the direction and pace of innovation, to the interrelationship between government and industry on issues such as standards setting, to the rights of employed inventors, to the stimulation of competition, to consumer participation, and to the rights of displaced workers. In short, the problem of innovation is very much an institutional problem. It is very much a result of the way in which we do business in this country. For the promotion of innovation as well as for a host of other reasons, serious consideration should be given to the Federal chartering of our larger corporations.[20]

Antitrust enforcement and Federal chartering speak to the prevention of corporate power from impeding innovation, and to the protection of the most fertile ground for innovation—small businesses—from that corporate power. But there are also positive measures which can be taken to nourish the ability of small business to innovate. Two specific vehicles for this purpose that have been experimented with at the State level are a product development corporation and an industrial extension service.

Product Development Corporation

The State of Connecticut has had a quasi-public Product Development Corporation (CPDC) since 1973, modeled after the British National Research Development Corporation. Its purpose is to invest venture capital in smaller companies during the product development phase of innovation. It offers up to 60 percent of capital needed in return for a royalty on the sales of new products. The developer has no liability to CPDC or the State if the product proves commercially unsuccessful.

The CPDC was given a small amount of initial funds for administrative expenses from the Economic Development Administration, but money for risk capital comes from the sale of bonds. While Connecticut has yet to receive any substantial amounts of return in the form of royalties, its expectation is high following what will probably be a lengthy buildup period. The British corporation upon which it is modeled currently has an annual income of $20 million, generated as a result of $50 million in grants.[21]

The Public Interest Subcommittee finds the Connecticut Product Development Corporation a model worthy of Federal Government support and encouragement. It is an instrument through which small business can be specifically and efficiently aided. It is an instrument through which innovations that have difficulty gaining access to traditional sources of money can be aided. At least two of the projects supported in Connecticut strike us as being of that type: a new type of phone system and a process to convert industrial waste into energy. It would be possible for the selection process of such a corporation to give specific weight to the type of public accounting suggested above. While investments of this type of corporation should be in potentially profitable ventures, added preference could be given to a potentially profitable venture that, for example, enhanced the environment or provided lower cost housing.

There are various actions that the Federal Government could take to promote State-level corporations of this type. Dissemination of information is certainly one. The EDA, or some other agency, could support the salary and expenses of one person who has been deeply involved in the Connecticut effort to hold seminars on their experience for interested small businessmen and government officials in other States, and to give technical assistance in establishing such a corporation. The Federal Government could design and either implement or help States in implementing a survey of small business to determine the extent to which lack of venture capital is in fact impeding innovation. If such a survey found that lack of capital is an important factor, States would have a potent tool to use in gaining legislative and voter approval of such schemes as a development corporation. And if States were

[19] Opening statement of Senator M. Kennedy, Hearing on Conglomerate Merger, July 27, 1978.

[20] For further discussion, see Hearings before the Committee on Commerce, United States Senate, 49th Congress 2nd session on Corporate Rights and Responsibilities, Serial No. 94–95 and Ralph Nader, Mark Green and Joel Seligman, *Taming the Giant Corporation* (W. W. Norton Co., 1976).

[21] Craig Stein and Don Fisk, "State and Local Government Industrial Technology Development Programs: An Overview," Draft, U.S. Department of Commerce, 1978.

ready to implement a development corporation, startup and planning grants from the Federal Government would certainly be in order.

Extension Service

The idea for a technology extension service, for small businesses and consumers, is based on the perception that small- and medium-sized businesses do not understand or see the potential role of technology in improving their economic situation. The same could be said for consumers in, for example, the field of energy conservation.

Even when a small business person or consumer perceives a problem as amenable to a technological solution, he or she probably would not know where to gain access to such technology. It might exist within the Federal National Technical Information Service, it might exist within universities, or it might exist within other corporations. Consider, for example, the current confusion over insulation, which has led to consumer paralysis and falling sales. To help businesses and consumers both to understand the potential of technology and to find needed technology, an extension service could be both a promoter and a locator.

Another critical function is communication from small businesses and consumers back to inventors and engineers. Unlike a large corporation, which can order its R. & D. staff to solve specific problems, the small enterprise has had to take what technology is offered in the marketplace. Such technology has often been much more suitable for larger scale operations. Consumers have virtually no channels to make known their needs. An extension service could provide that vital link from the smaller enterprises and consumers to the creators and purveyors of technology, a link that is needed for the development of technology that is more useful to smaller operations.

Four States have made beginning efforts to develop an industrial extension service of some type. Three, Georgia, Pennsylvania, and Michigan have attempted to develop the concept of the two-way street, but their activities are very limited and sparsely staffed. Such programs have small budgets and are often the first to go in State fiscal crises.[22]

The Federal Government should give the support and spread of such programs the kind of attention and backing that launched and sustains the agricultural extension service. (The FY 1979 budget provided $262 million for agricultural extension, while the Pennsylvania Technical Assistance Program may fold for lack of $200,000.) Such an effort would create a national priority and climate of support for innovation designed for and implemented in smaller enterprises.

The specific focus of such efforts could, again, be guided by the public accounting model. Past State efforts have suggested that efforts directed at a few industries have been more successful than efforts to spread resources to all types of enterprises. Preference could, for example, be given to enterprises specifically producing and/or distributing nutritional food, or those specifically engaged in the health or environmental fields, or those producing products resulting in significant cost savings for people at lower income levels.

[22] *Ibid.* The State efforts are described in that paper.

Small Business and Regulation

One additional issue relating to small businesses is important to address in the context of innovation. There is a frequently heard complaint that the impact of regulations or the "burden" of regulations fall most heavily and unfairly on small businesses. The extent to which this is actually true, as opposed to the extent to which this argument is used by big business to gain sympathy for attacks on regulation, is not clear. Regulatory agencies could be given the responsibility to determine the truth of such an assertion on a case by case basis for particular regulations. If an undue burden does fall on small business because technology for compliance is only available in large scale, the Federal Government should provide assistance in the form of grants and coordination between companies for the development of compliance technology of the appropriate scale.

RECOMMENDATION

The Government should implement the findings of previously commissioned studies of innovation—which have shown that most innovations originate in small businesses and that incentives aimed at them are likely to be most cost effective—by specifically fostering small businesses.

RECOMMENDATION

Existing antitrust laws should be vigorously enforced and the concept of antitrust should be expanded to cover the adverse effects of conglomerates and financial interlocks.

RECOMMENDATION

The concept of Federal chartering of giant corporations should be further developed and implemented as a means for providing an institutional framework both conducive to innovation and responsive to the needs of society.

RECOMMENDATION

State-level product development corporations should be assisted and encouraged as a means to provide commercialization capital to small businesses and to types of innovations for which traditional sources of money are difficult to tap.

RECOMMENDATION

Federal-State extension services should be established to help small businesses to gain access to technology, to inform consumers of available technology in areas of special need, to communicate the special needs of small businesses and consumers to inventors and engineers, and to foster development of technology suitable to small-scale operations.

ALTERNATIVE FORMS OF ENTERPRISE

There is considerable interest within the Subcommittee in the relationship between innovation and alternative forms of enterprise. Alternative forms of business organization would include community-owned enterprises such as local power generating facilities, neighborhood corporations, cooperatives, employee-owned businesses, and public or quasi-public enterprises. Such forms, almost by definition, can be more responsive to public needs than are more traditional enterprise forms. There is evidence that they are also more likely to produce innovations attuned to the needs of society, innovations which score highly on the public accounting.

Worker-owned firms, for example, have a long record of significant increases in productivity, much of which can be attributed to innovations in connection with specific work processes. Often the accumulation of small, nondramatic, practical shop floor innovations has had a very high payoff—greater than "big science" innovations. For example, within 1 year of the purchase of the South Bend Lathe Co. of South Bend, Ind., by its workers, productivity there jumped 25 percent, due in good part to worker innovation.[23] In a study conducted in the 1950's, worker-owned Plywood companies in the Pacific Northwest averaged 20 to 30 percent higher productivity than conventionally owned firms. In the 1960's, the firms averaged 30 percent higher productivity.[24] In one specific example, the employees of Tembec Forest Products purchased a 44 percent interest in the firm in 1973. According to the firm's management, in the first 3 years after the change of ownership, productivity increased 30 to 40 percent, absenteeism dropped from 3.9 percent to 1.7 percent, there were fewer grievances, less pilfering, and more employee suggestions on means of improving productivity.[25]

Fostering such new economic institutions should be a major thrust of Federal policy. In many cases, such a thrust could overlap with efforts to alleviate localized, structural employment. The targeting of public procurement, as envisioned in recent Presidential executive orders, should be expanded to help stabilize local economies. Special consideration should be given to alternative forms of enterprise. These governmental goals and efforts should be coordinated.

Although this review is primarily concerned with innovation in industry, in the private sector, it is important to note that public agencies, publicly owned corporations and laboratories can and have played a significant role in innovation. The Bureau of Standards, the Tennessee Valley Authority, the Forest Service, and many other public institutions have contributed substantially to new developments in technology and innovation. For instance, without NASA, the modern microcomputer industry would not have been possible. Likewise, the synthetic rubber industry was created and developed by publicly owned corporations in the 1940's and 1950's. The concept of "yardstick" public corporations has also received considerable support in Congress.

RECOMMENDATION

The experience of existing alternative forms of enterprise in the United States and abroad should be compiled, with attention given to their impact on both the rate and direction of innovation. Alternative forms of proven value should be specifically fostered by government policy.

ALTERNATIVE TECHNOLOGY

At the heart of the framework outlined in this report is the assumption that human and social needs—as recognized by existing national legislation—should be the primary determinants of government-sponsored or subsidized innovation. Technology, in this framework, is not a neutral force; it can advance or retard national goals and commitments. Thus, when the Government supports technological research and development, it should seek out those developments that offer the most potential for meeting public needs.

Technology, in other words, should be appropriate for the human and social goals desired. For instance, high technology solar energy development—like the proposed solar power towers in the Southwest—might not be as appropriate to the needs of citizens and communities as smaller scale, more decentralized operations like community or neighborhood solar collectors. And nuclear technology—with its huge capital requirements and its environmental, health, and worker-exposure risks—is certainly less appropriate than any form of solar technology.

This concern for "appropriate technology" has gained considerable public attention and support in recent years, and there are a growing number of efforts to implement this approach, particularly at the community or neighborhood level. There are efforts, for example, to operate small-scale industry utilizing renewable resources to serve and help create local markets. One of these is a resurgence of interest in small-scale production of wool and wool clothing. In addition to providing employment in rural areas, wool production saves the fossil fuels used for synthetic fiber production, conserves energy in the production process, and can compete with imports of wool and wool clothing.

The public accounting framework developed in this report lies at the heart of many of these efforts. The effort to develop appropriate forms of technology could be, and should be, a major thrust of government innovation policy in the coming decades. It offers an important means by which we and our children can comfortably live in a resource-constrained future.

Right now, there is tremendous need for quality control and for dissemination of information about appropriate technology. A recent study sponsored by the National Science Foundation notes a crucial need

[23] "Employee Ownership," Report to the Economic Development Administration, University of Michigan Survey Research Center, Institute for Social Research, 1977.

[24] Katrina Berman, *Worker-owned Plywood Companies and Economic Analysis,* Washington States University Press, 1967.

[25] Timothy Jochin, "The Labor-Management Relations Implications of Employee Stock Ownership Plans," Unpublished Manuscript, College of Business, Bowling Green State University.

for the buildup of a repertory of techniques in appropriate technology that are documented and made accessible to local groups so that they can evaluate relative merits before they act. The study also notes the necessity for extension services and community organizations that can bring the benefits within the reach of local innovative groups, and advocates a role for the Federal Government in the general areas of "pilot projects and incentive structures which foster the transfer of information and skills; the exploration and assessment of alternative policy options; and specific research programs, ranging from basic concept development to analysis and evaluation of new techniques." [26] The Public Interest Subcommittee supports the recommendations of this study, and would urge their implementation.

RECOMMENDATION

Appropriate technology should be fostered as a specific effort to innovate within a "public accounting" framework, as the cutting edge of innovation for the next generation. The recommendations of a recent National Science Foundation study for buildup of a documented repertory of appropriate technology techniques, for extension services and community organizations for disseminating these techniques, and for a continued facilitating role for the Federal Government should be implemented.

CONSUMER PARTICIPATION

We have discussed concern over the direction of innovation, and have indicated that big corporations often "innovate" in ways that are not responsive to the needs of the consumer and of society. One reason this occurs is that there are now no structures through which consumer needs are communicated to giant corporations, or through which consumer needs are injected into government policy. Such structures need to be invented.

There is a crying need for innovation here.

The proposal for the Federal chartering of corporations contains one possible solution to maintain a consumer voice in corporate policy. It includes a provision for a consumer constituency represented on the board of directors that actually directs the corporations.[27] (Other constituencies could be workers, community and environment.)

Consumer—or we could say citizen—participation in government policymaking is now very spotty and sparse. We advocate a strong consumer/citizen representation at all levels of policymaking, injected early enough to have a creative or innovative effect.

RECOMMENDATION

Institutions must be devised through which consumer needs are communicated both to big business and to government, and through which there is consumer/citizen participation at critical stages in policy formation.

DEFENSE SPENDING AND CONVERSION

No review of industrial innovation is complete without talking about the types of research and development that the Government directly supports. Government resources are now overwhelmingly directed to national defense and the space program.

Military spending as a whole accounts for about 25 percent of the total budget.[28] Spending on research and development for national defense and the space program accounts for more than 60 percent of total Federal spending on research and development; in 1976 $13.5 billion was devoted to defense and space R. & D.[29] In an era of scarce government funds, such allocations directly detract from the support available for developing the foundations for either innovations in social priority areas or innovations which improve industrial productivity.

The Political/Economic Support for Defense Spending

Defense spending has two bases of popular support, that of providing national security and that of providing economic stimulation to the economy as a whole and particularly to specific local economies. Most people would agree that we need some level of security for the Nation. But we submit that there never has been a thorough determination of the minimum possible cost of an acceptable level of security; there never has been an effort to perform true zero-based budgeting for defense.

The economic justification of defense spending is even more suspect. Several studies indicate that there are far better ways to generate employment than through military expenditures. Military expenditures tend to support fewer jobs per dollar than do expenditures by other industries.[30]

Other studies point out that military R. & D. is an extremely high consumer of engineering and scientific personnel and some grades of highly skilled production labor, both in relation to dollars spent and in its share of the employment of that type of personnel in the economy. One estimate indicates that from one-third to one-half of the engineering and scientific personnel in the United States have been directing their attention to the development of technology for military uses.[31] Defense-related work is thought to pay better and be more prestigious than civilian employment. Some commentators have argued that this preemption of technical talent bids up the cost of nondefense re-

[26] "Appropriate Technology in the United States—An Exploratory Study," National Science Foundation, Research Applied to National Needs, 1977.

[27] "Federal Chartering of Giant Corporations," proceedings of a conference held on June 16, 1976, in Washington, D.C., organized and sponsored by the Commission for the Advancement of Public Interest Organization.

[28] B. G. Lall, *Prosperity without Guns*, Operation Turning Point, New York, N.Y.

[29] *Science Indicators*, 1976.

[30] See, for example, the studies of Chase Econometrics Associates and Roger Bezdek, both quoted in Michael Edelstein, *The Economic Impact of Military Spending* (New York: Council on Economic Priorities, 1977) and "Factbook for Estimating the Manpower Needs of Federal Programs," U.S. Department of Labor, Bureau of Labor Statistics, Bull. No. 1832, 1975.

[31] Lloyd J. Dumas, "Economic Conversion, Productive Efficiency and Social Welfare," *Journal of Sociology and Social Welfare*, Vol. IV, No. 3 and 4, 1977. Estimate is for mid-1960's. No current estimates seem to be available.

search and development work that might be undertaken by U.S. companies. According to Seymour Melman,

> The military economy has grown so big that it is pushing the civilian economy into decline. The preempting of technical skills and capital resources for aerospace and associated military projects impoverishes the civilian sector and checkmates growth in productivity, which in the past has been a central element of American economic strength. The mysterious combination of inflation and unemployment is largely an outgrowth of this once unnatural state of affairs.[32]

The balance-of-payments benefit from the export of arms is still another flawed economic argument that is used to support defense spending. One study puts this claim into perspective: "During the years 1955–70 (inclusive) there was a huge inflow of foreign currencies into the United States represented by a cumulative balance of trade surplus of nearly $62 billion. But during those same years, net military expenditures abroad [net after military sales abroad] were responsible for an outflow of dollars from the United States to more than $43 billion. The outflow of U.S. currency owing to military spending abroad thus wiped out 69.9 percent of the balance of trade surplus, 1955–70."[33]

A final argument for high levels of defense spending is based on fear of its absence. Local communities dependent on defense spending dread its withdrawal, and a representative in Congress elected from such an area must protect not only his or her own defense contracts but also those of all other representatives to ensure return of the favor. With some commitment to the concept of conversion, and some advance planning, there could be an alternative to such behavior.

Conversion

Conversion means advance planning for dislocations, and a commitment to finding civilian and social purposes for the resources previously used for military research or production. Conversion means, above all, planning for change. It means finding and recognizing good alternative endeavors for those engaged in defense work—within the plant and within the community. It means minimizing the need for worker relocation and retraining for new industries.

To accomplish this, conversion requires the cooperation of the company, the workers, the union, the community, and various government agencies. It also requires a willingness on the part of management and technical specialists to learn new skills; managers must learn to substitute consumer and community demand analysis for expertise in procurement regulations and congressional lobbying, and engineers must learn to design consumer and community products for reliable performance at minimum cost.

There have been examples of both successful and unsuccessful attempts at conversion. Perhaps the most notoriously unsuccessful example was the effort of Rohr Company, a firm that made its reputation in aerospace and related operations, to be the prime contractor for San Francisco's BART. There the unfortunate defense contracting habits born of cost-plus contracting and lack of accountability for performance were not broken, and BART was plagued with problems of reliability and cost overruns.[34]

The Philadelphia company of Boeing-Vertol provides an example of a far more successful effort at conversion. There, planning began early against the time when the demand for helicopters would drop. When the company lost out to another for supplying the basic combat helicopter for the 1980's, the beginnings of an alternative already existed. Today, two-thirds of the work force is still on helicopter production. The other third is designing and providing fleets of electric trolleys for Boston, San Francisco, and Chicago—the first to be produced in the United States in 25 years.[35] The progress of the company bears watching to see how they do on performance and cost.

Every military-serving industrial firm and military base with more than 100 employees should be required to work out a specific conversion plan as a condition of fulfilling a defense contract or operating as a military base. The targeting of new jobs to areas of conversion is an important goal of public policy.

The Federal Government should also provide an economic backstop for individual employees, because even the best conversion planning will involve some dislocations. This might include a guaranteed income for a given time, job retraining to free administrative and technical employees from their habituation to the military economy, and relocation assistance where necessary.

RECOMMENDATION

Defense spending should be subjected to an effort at zero-based budgeting. The effort should include a determination of whether an excessive proportion of government spending on research and development is devoted to defense and an assessment of the effect of defense R. & D. on personnel available for civilian R. & D. and on the costs of civilian R. & D.

RECOMMENDATION

Advance planning for conversion to civilian research or production for civilian needs should be a required feature of all defense contracts.

THE EFFECTS OF INNOVATION ON WORKERS

The applicability of the concept of conversion stretches beyond defense industries. There exists a dual responsibility of employers and government to mitigate the effects of specific dislocations of workers caused by innovation.

The most important part of employer's responsibility is an "early warning system," to inform the workers

[32] "Beating 'Swords' into Subways," *The New York Times Magazine*, Nov. 19, 1978, p. 43.

[33] Dumas, *op. cit.*, p. 571.

[34] *Ibid.*, p. 582.

[35] Seymour Melman, *op. cit.*

and unions as soon as possible about impending innovations that might cause dislocations. Employers also have responsibilities to provide retraining opportunities, to attempt to develop jobs for the workers within the plant or company, to offer optional early retirement, and to provide other assistance as appropriate. Conversion rather than replacement should be the governing principle.

Legislation to mandate an "early warning system" and to require corporate assistance to displaced workers and their communities has been introduced in the Congress. Such legislation should be supported.

The Government also has responsibilities to workers. Efforts to promote innovation are likely to cause specific dislocations for workers and hardship for communities, as do various trade decisions made by the Government. The Government has basic responsibility in conversion planning and conversion assistance, as applied to trade and innovation, to workers and communities. The various pieces of such assistance, such as EDA in Commerce, Trade Adjustment Assistance in Labor and Commerce, and CETA in Labor, and local prime sponsors should be brought together into a comprehensive program, based on the principle that the economic policy decisions of our Government must be made for the good of the whole, but the consequences of those decisions should not be borne by a hapless view. As mentioned previously, such a policy to guarantee job security to specific workers in specific communities is essential to foster innovation.

RECOMMENDATION

Employers and the Government should share the responsibility to ensure that workers do not bear the burden of innovation. Employers should provide early warning, and assistance such as retraining, job development, and optional early retirement if necessary. Government should provide planning and coordination based on the concept of conversion.

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